

The AUTOMOBILE

Brass and Bronze—Offsprings of Copper

Copper the Trunk of the Non-Ferrous Family Tree,
with Zinc Forming the Brass Branch
and with Tin, the Bronze

Part 1

By J. Edward Schipper

IN the bowels of the earth below mighty Mount Aetna was the workshop of the one-eyed giants called the Cyclops. Here, according to the mythology of the ancient Greeks, Polyphemos, chief of the giant band fashioned the thunderbolts for Jupiter and also in his roaring furnaces produced huge implements of bronze. With a thunderbolt forged from this metal Jupiter killed Aesculapius, the son of Apollo. Such is the mythical beginning of the great industry of the manufacture of bronze.

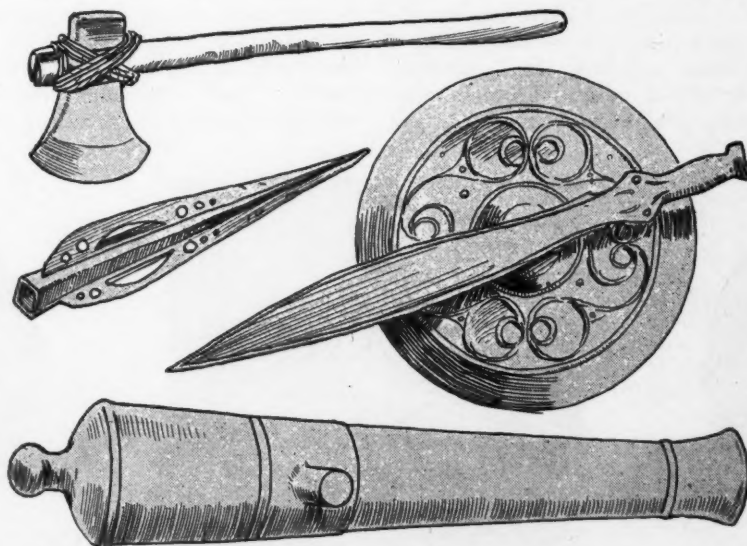
Leaving the realm of the gods and coming down to the kingdom of man, archaeologists assert that between the periods of human culture known as the stone age and the iron age, there was a period called the bronze age. These three great periods of human development overlapped, they say, as is proved by the fact that implements have been found composed of stone and bronze, of bronze and iron and even in a few cases of stone and iron, showing that the bronze age bridged quite incompletely the lapse in time between the periods of stone and iron. The bronze age is thought to

have existed 2000 B. C. in several scattered parts of the world.

A Greek manuscript of the eleventh century, one of the prized possessions of the library of St. Marks, Venice, gives the composition of bronze as 1 lb. of copper combined with 2 oz. of tin. From that time on records are plentiful mentioning bronze and its uses. The bronze of classical antiquity consists of copper alloyed with one or more of the metals zinc, tin, lead and even silver depending on the time and the use for which the alloy was intended. From the analyses of old coins it is learned that the Greeks used an alloy of

copper and tin until about 400 B. C. when they began to substitute lead for tin with increasing frequency. In the oldest bronze relics the copper content varies between 67 and 96 per cent.

The ancient history of metals which have copper as their base is not confined to the old world. The American Indians had ornaments which were made from copper and from natural alloys of that metal. The mound builders whose relics are found over vast areas of North America were familiar with copper in many



Bronze weapons from the bronze age to the nineteenth century

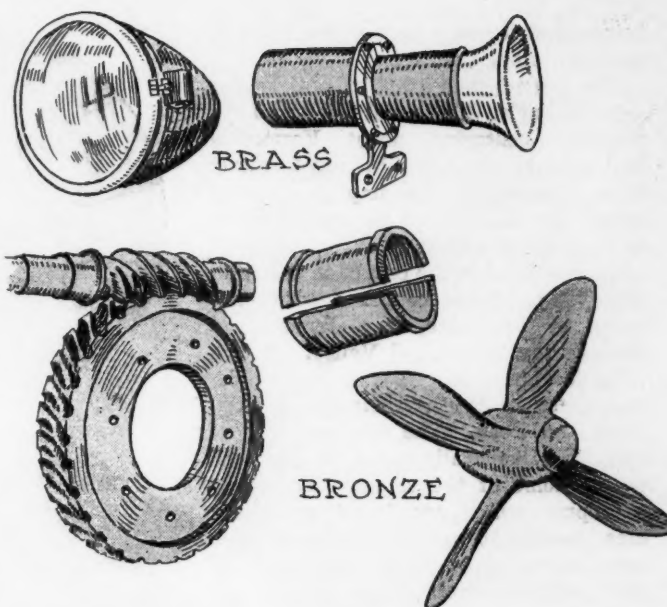
metals are both offsprings of the same parent metal.

It is far from true to suppose that the whole mass of non-ferrous alloys springing from the common base copper can be classified under the heads brass and bronze. Clear as the original compositions of these two metals are, the brasses and bronzes of to-day can not be dismissed by this simple classification because many of the alloys contain both zinc and tin. This would make them both, brass and bronze, or neither. Manganese bronze in common use, is an example of this. This often contains both tin and zinc and as a result falls under both heads and to-day committees appointed by the engineering societies are wrestling with the problem of a definite classification of them. It has been suggested that the entire brass and bronze classification be cast aside and the metals divided into forging and non-forging.

Qualities of Copper Imparted

Copper, as the mother-metal, must impart some of its qualities to its offspring regardless of the number and quality of the alloying substances added. In studying the characteristics of a certain family, we would look for them first in the root of that family. Therefore to know something about the family of non-ferrous metals, we must first study copper. If the ancestor of a family is unyielding and war-like in character, we would scarcely look for the descendants to be agriculturists. If copper were hard, brittle and heavy, or on the other hand soft and light, it is of interest to know how these qualities have been utilized in the products developed from it, what alloying substances have been added to subdue one quality and to accentuate another and so on throughout the gamut of reasons for alloying metals.

Ductility, malleability and tenacity are the three great qualities of copper. It is the possession of all three that endows it with its peculiar importance in machine and structural work. In addition it has a high melting temperature, fusing at about 1930 deg. Fahr. as compared with lead at 625 deg. Fahr. It is high in electrical conductivity and in heat conductivity is second only to silver, the highest, having a capacity in this respect of 73.6 per cent of that of silver.



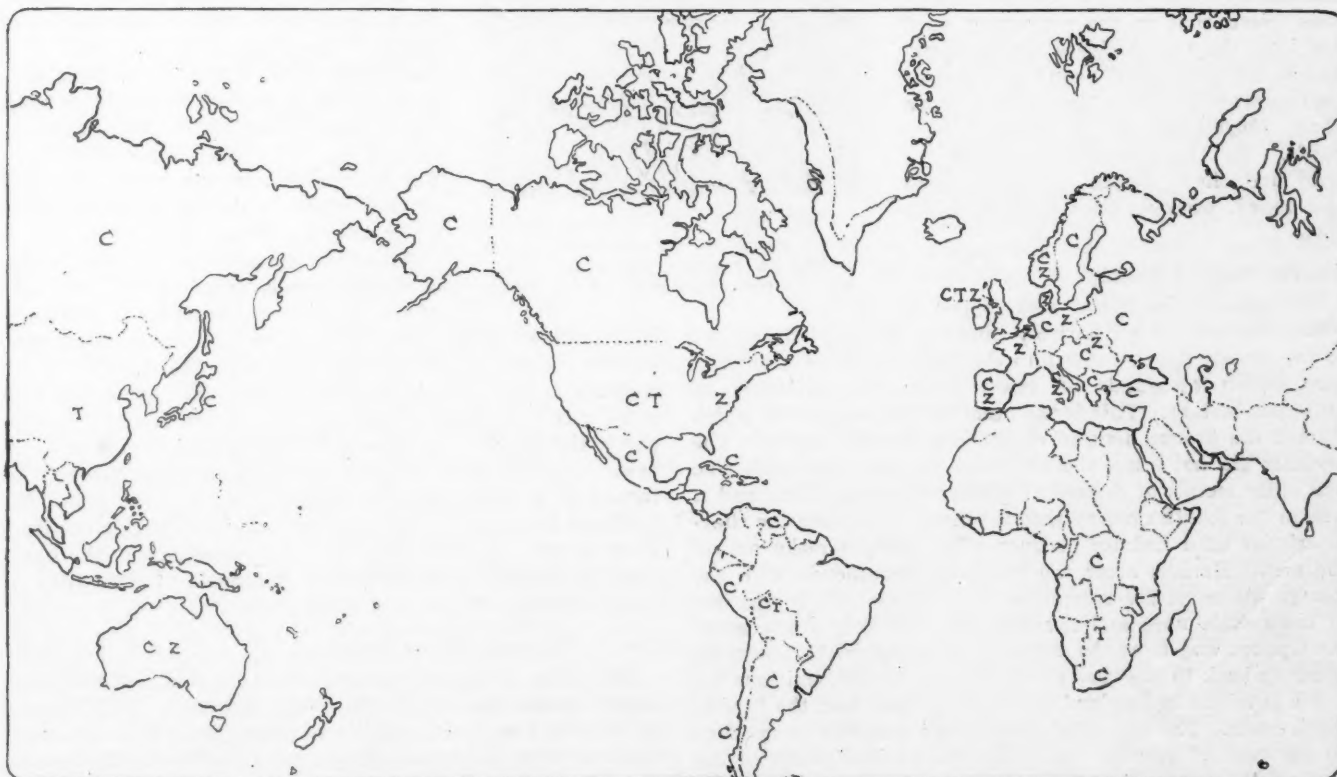
Brass and bronze articles of highly important commercial use

The tensile strength of copper is 20,000 to 30,000 lb. per square inch or about a third of crankshaft steel and in weight it is about nine times as heavy as water having a specific gravity of 8.95.

Heredity of Non-Ferrous Family

These are the family characteristics of the mother-metal copper. These are the family traits which can be traced though, at times very faintly, throughout the great family of non-ferrous metals springing from this common ancestor.

In nature copper is most widely distributed. It exists in sea weed and the blood of certain mollusks. It is part of the composition of straw, hay, eggs, cheese, meat and other articles of food. It is in the liver and kidneys of human



Map showing the parts of the world which produce most copper, tin and zinc, which are indicated by the initials C, T and Z

beings and forms a part of the blood of man and other animals.

The largest masses of natural copper deposits known are those found near Lake Superior centering about Keweenaw Point, Mich. Here, the Indians formerly used the copper for implements and ornaments, and one of the metals found in connection with it is silver, which is often imbedded in the copper in the form of crystal. Other copper deposits are found in Tennessee, New Jersey, and through the Mississippi Valley.

In foreign countries the largest deposits are in South Australia, Siberia, Chile and Peru. The ores are moderately rich, generally above 50 per cent pure. Some of the sulphur compounds of copper which are found as copper ores, contain 80 per cent, whereas other ores containing a large proportion of iron sulphide, contain less than 5 per cent of copper.

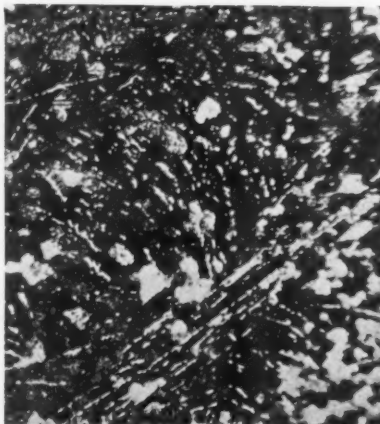
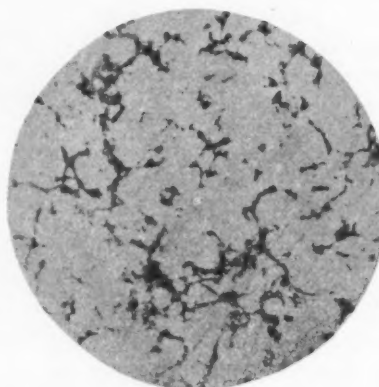
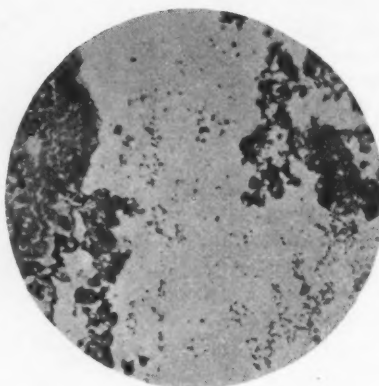
Three principal methods are used for reducing copper from its ores: They are known as the pyro-metallurgical or dry method; the hydro-metallurgical or wet method; and the electro-metallurgical or electrical method.

The process used depends upon the ore, and the locality in which the refining is done. The impurities contained in coarse copper are mainly iron, lead, zinc, cobalt, nickel, bismuth, arsenic, antimony, sulphur, selenium and tellurium. These are generally eliminated by oxidizing, transforming the products into slag, or gases or by electrolysis. When the Bessemer method of decarburizing pig iron was discovered, it was immediately utilized for copper but it was found that in the converters used for iron, the tuyeres were not arranged to suit the action of the copper. The converters were improved and in 1911, more than 400,000,000 lb. of copper were made. By the electrolytic method the gold and silver content of copper ores are saved, whereas they were formerly lost.

Tin Has Ancient History

Tin which is combined with copper to form bronze is of an entirely different nature. Being one of the metals which enter into the composition of bronze, it was known thousands of years before the existence of authentic history. This is the other of the two metals which started the bronze division of the non-ferrous family. The ancients did not know the difference between tin, lead, zinc and other metals of somewhat similar characteristics, and it was in the fourth century that tin began to assume the characteristics of a definite product. The early Greeks named the metal Hermes after the god who corresponds with the Roman Mercury, the messenger of the gods. This was one of the metals used and fabricated in the fiery furnaces of the Cyclops and from the accounts of mythologists, traces its ancestry back to the time of the Greeks and Phoenicians.

Tin is mined in England, Saxony, Bohemia and the Straits Settlements. The ores after preliminary washing carry 65 to 75 per cent of metallic tin. Thus, this metal which in the ancient times was found in close proximity to the copper



While heat has its influence on the micro structure, its influence is not utilized as in steel. The above photomicrographs show some of its effects

deposits, as is shown by the fact that the two were combined in fashioning the crude implements of pre-historic times, is now drawn from an entirely different quarter of the earth.

Two processes are used in smelting the ores, both being by furnace: The first, crude implements of pre-historic times, tical circular, or sometimes rectangular hollow shaft in which are placed alternate layers of coke and ore. An air blast introduced near the bottom of the furnace carries the flames throughout the shaft.

The second, is a reverberatory furnace in which the process consists of mixing the purified ore with about one-fifth of its weight of anthracite coal, which is moistened and then fused on the sole of the furnace for 5 or 6 hr. The slag and metal produced are then run off, the latter being cast into bars which are refined and freed from impurities, chiefly iron, arsenic and copper. It is one of the traditions that in refining tin, an inclined hearth is used in which the pure tin runs off and is further purified by stirring with the branch of an apple tree. In testing for purity, the workman heats the tin bar until quite near the melting point and then drops it to the stone floor. If the tin is pure it will splash into a series of granular strings.

Tin a Great Hardener

The physical qualities of tin give little clue to what its action would be when combined with other metals. Studying its qualities alone, it would not be thought that this necessary element in bronze would have such a marked effect on a metal with the characteristics of copper. The specific gravity of tin is 7.293, the metal is white, lustrous, soft, very malleable and has but little tenacity. The tensile strength is about 3500 lb. per sq. in. It fuses at 442 deg. Fahr. has a heat conductivity of 14.5 per cent of that of silver and finds its chief use as an alloying substance.

From the specifications of the metal, it would never be suspected that it is one of the best known hardeners in existence.

This is an instance where a metal soft in itself, unites with another metal which is also soft with the result that it hardens it to such a degree that it can only be turned in a lathe with the greatest difficulty. When tin is added to copper to the extent of 30 per cent it attains its maximum hardness. Containing up to about 24 per cent tin bronze can be turned in a lathe without difficulty. After that point, the hardness increases rapidly until it reaches its maximum from 30 to 40 per cent, with the further increase of tin, the hardness decreases. The maximum strength of the alloy is reached with 17.30 tin and 82.70 copper.

Zinc with Copper Makes Bronze

While tin is on one side of the scale and together with copper makes up the fundamental mixture of the bronze division of the family, zinc is on the other side and in combination with the parent metal copper, makes up the body of the brass division. Zinc resembles copper in that it is ductile

and malleable, although to a much less extent. Its tenacity, however, is far less than that of copper, being about 1/10 that of iron, as is shown by its tensile strength of 6000 lb. per sq. in. One of the remarkable features of zinc is its non-corrosive quality due to the fact that upon the surface there forms a thin film of carbonate of zinc which protects the metal from corrosion.

In the tales of antiquity zinc plays as important a part as the other metals which have been spoken of. Aristotle refers to brass as the metal of the Mosynoeci. It is also referred to frequently in the writings of Pliny, who mentions a metal cadmia which served for the conversion of copper into another metal which he called aurichalcum. As late as 1702 the metallurgists stated that the formation of brass was the union of a metal with an earth. Subsequently these authorities adopted the view that cadmia, which was referred to by Pliny, was a metallic calx having the property of dying copper yellow.

The word zinc was first used in the form zinken, and it was not regarded as a pure metal.

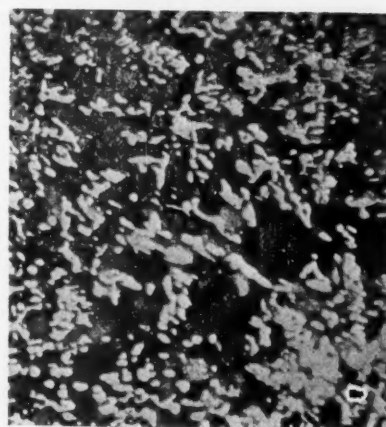
Zinc and bismuth were also often confused, and both were called indiscriminately spelter, a name which still exists, although in its modern usage it refers only to zinc and is used merely commercially.

The working of zinc was part of the old Indian civilization, being described in 1597 by travelers as a peculiar kind of tin. History is not quite clear on the date when zinc was first isolated, although it is known that the art of zinc smelting was in existence in Great Britain about 1725.

The world's supply of zinc has increased remarkably during the last century. Germany was practically the only producer of this metal up to 1833. Immediately after, Russia became one of the important producing countries, and in 1837 Belgium joined the ranks followed by England and the United States, which commenced to produce at the rate of 6000 tons per year in 1873. At the present time, the biggest producers are the United States, Germany, England, France, Spain, Austria and Belgium. The world's supply of zinc in 1910 was 450,000 tons. According to a report from Washington, the State of New Jersey is an important factor in the world's supply, the zinc mines of that State having increased their output from 144,312,560 lb. of recoverable zinc in 1913 to 148,506,500 lb. in 1914.

Zinc Is Ductile

Zinc being ductile and malleable and of low tensile strength, it would be at once imagined that the alloys of copper and zinc would have great ductility and malleability although the tenacity might perhaps be low. Yet the effects of zinc are of such a varying nature, that different alloys instead of following a definite scale of increase and decrease in strength and other physical qualities, vary quite quickly with different percentages of zinc. As zinc is added, the tensile strength gradually increases from about 27000 lb. per sq. in.



Microphotographs showing the varied nature which can be possessed by practically similar compositions of bronze

for 98 per cent copper and 2 per cent zinc up to 50,000 lb. for 60 per cent copper and 40 per cent zinc. The strength again decreases quite rapidly after passing 48 per cent copper to 52 per cent zinc where the tensile strength is about 24,000 lb. until it becomes as low as 1800 lb. per sq. in. with a composition of 33 per cent copper to 66 per cent zinc. Strange to say the strength again rises, becoming 18,000 lb. per sq. in. for a composition of 5 per cent copper to 95 per cent zinc.

Thus, zinc plays the rôle of a strengthener until it forms about two-fifths of the alloy; from then on down to the point where it forms two-thirds of the alloy it acts as a weakener as far as tensile strength is concerned, the strength curve again taking an upward trend until with zinc 94 per cent of the entire mixture, the tensile strength becomes 18,000 lb. or three times that of zinc alone. In other words, it is the effect of the parent metal copper upon the zinc which increases the tensile strength at this point.

One of the strange features of the brass end of the non-ferrous family is that the zinc has a marked effect upon the color of the resulting alloy. The red copper becomes a reddish yellow between 2 per cent zinc and 15 per cent, where it gradually blends into a yellow red until at 25 per cent zinc the color of the alloy becomes a pale yellow which gradually deepens as 60 per cent zinc is approached. Here the color again takes a turn, passing over into a silvery white, becoming light gray at about 61 per cent and carrying this color until it gradually becomes a dark gray at about 83 per cent zinc.

Structure Also Changes

Another strange and interesting fact about these changes of color is that the interior structure of the metal also changes, the red-yellow shade having a coarse structure at the lower percentages of zinc and then changing to a structure which becomes finer as the yellows are approached, then becoming coarse again

as the darker yellows are blended into the mixture until the grays are reached when the coarse structure begins again to give way to a fine content which it holds until the mixture is pure zinc without copper.

This change of color, strength and ductility which occurs coincidentally is one of the features of the brass family which renders it distinctive. The uses to which one of these metals can be put can largely be judged by the color. The white metals which have most copper are generally too brittle for any practical use, but the yellowish metals which range between 40 and 50 per cent zinc are of great value. In fact, by proper manipulation a member of the brass family can be made for practically any purpose, and if there were no other metals in existence, the work done by most of our other metals could in many cases be quite satisfactorily accomplished by specially designed combinations of copper and zinc. Brass may be made brittle and hard and it can be made soft and weak or soft and tough. It can be smooth or rough of surface and can take a polish which is almost mirror-like.

(To be continued)

Factors in Valve-in-Head Design

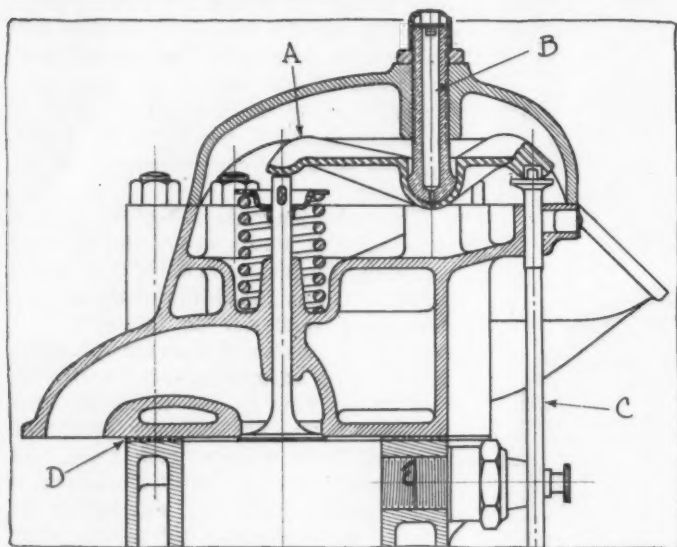


Fig. 1—Valve mechanism of Brush-developed valve-in-head motor. A—Rocker arm. B—Rocker arm stud. C—Push rod. D—Armored asbestos gasket between cylinder and head

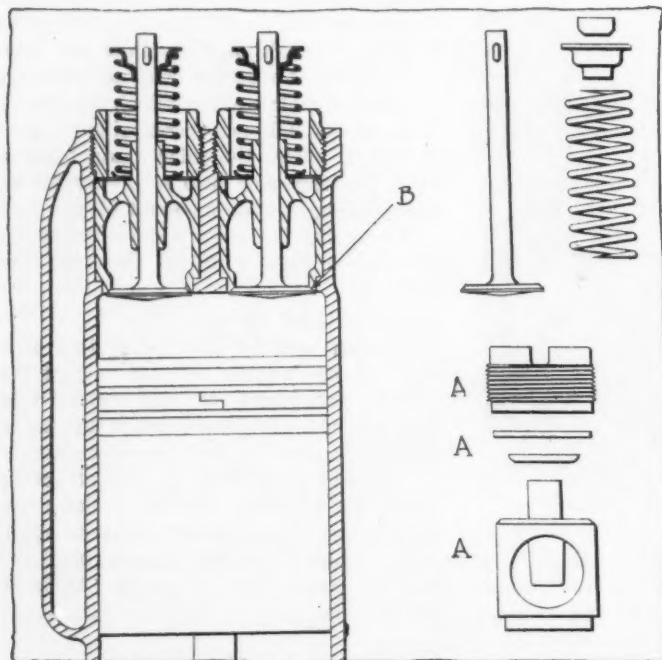
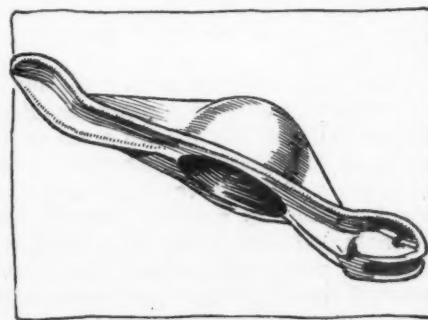
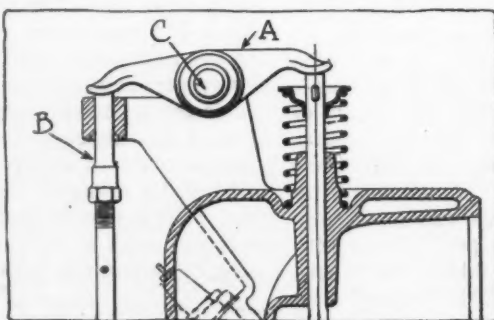


Fig. 2—Typical valve cage valve-in-head motor. A—Parts per cylinder eliminated by use of detachable head. B—Valve seat showing double wall between seat and cooling water

Left—Fig. 3—Typical journal type rocker. A—Rocker arm. B—Push rod. C—Rocker journal.

Right—Fig. 4—Light strong forged rocker of Brush type valve-in-head motor.



Numerous Refinements and Developments—Valve Cages Eliminated—Better Combustion Chambers

By W. A. Brush*

DETROIT, MICH.—Editor THE AUTOMOBILE:—Poppet-valve motors may be divided into two very general classes: one of these classes is the side-pocket class, that is, valves are located in valve pockets arranged at the sides of the cylinders. This class includes those motors commonly known as L- and T-head designs. The other class includes those motors which have valves located in the head of the cylinder. A great deal of skill and time have been expended by automobile motor manufacturers in refining and developing the side-pocket type of motor. Very little effort has been spent in the refinement of the valve-in-the-head motor.

The reason for this condition is not far to seek. The greater efficiency of the valve-in-the-head type has made it a popular motor, in spite of its comparatively crude design. Automobile buyers have set the seal of their approval on the overhead valve because of its efficiency, and in spite of the fact that no effort was made to improve its mechanism until within a comparatively recent period. The Brush Engineering Association, Detroit, has for the last 2 years been refining and developing this type of motor. The features which will be described are now embodied in motors made for the trade by several well known motor manufacturers.

Reference to Figs. 1 and 2 show the difference between the undeveloped and the refined type of valve-in-the-head mechanism. Fig. 2 is a typical section of the old type, valve-in-the-head mechanism, and the first thing that strikes the observer is the possibility of eliminating the valve cage and the parts necessary to hold it in place. A in Fig. 2 indicates the number of parts per cylinder which are not necessary in the developed type. Beyond the elimination of these useless parts, there is an added efficiency in the motor and a material decrease in the trouble possibilities, since it is evident that with valve cages, the valve and valve seat must be operated at a higher temperature than is necessary. Note that at point B in Fig. 2 between the valve seat and the cooling water, there are two thicknesses of metal; that is the wall of the valve cage and the wall of the cylinder proper. This means that the valve and valve seat must operate at a higher temperature than when the valve is seated directly in a detachable head as shown in Fig. 1. Operating at this higher temper-

*Editor's Note—W. A. Brush is business manager of the Brush Engineering Assn., consulting engineers, Detroit, Mich.

ature, both valve and seat are susceptible to undue carbon deposit and pitting. The valve itself, operating at the higher temperature, is more apt to warp and lose its shape.

Fig. 1 shows a valve seated directly in a detachable head. The water jacketing under these conditions is fully as thorough and intimate as is possible to be secured with any type of poppet-valve motor. It therefore operates at as low a temperature as possible and must therefore be correspondingly as little affected by carbon deposit. Any valve-in-the-head motor possesses the advantage over the side-pocket type of having its valves located where they are least easily reached by oil which may work up around the piston, therefore the valve-in-the-head with the valve seated directly in the head casting must, other elements being equal, require the least attention to keep it operating satisfactorily. In other words, it is the least susceptible to the valve diseases, carbonizing, pitting and warping.

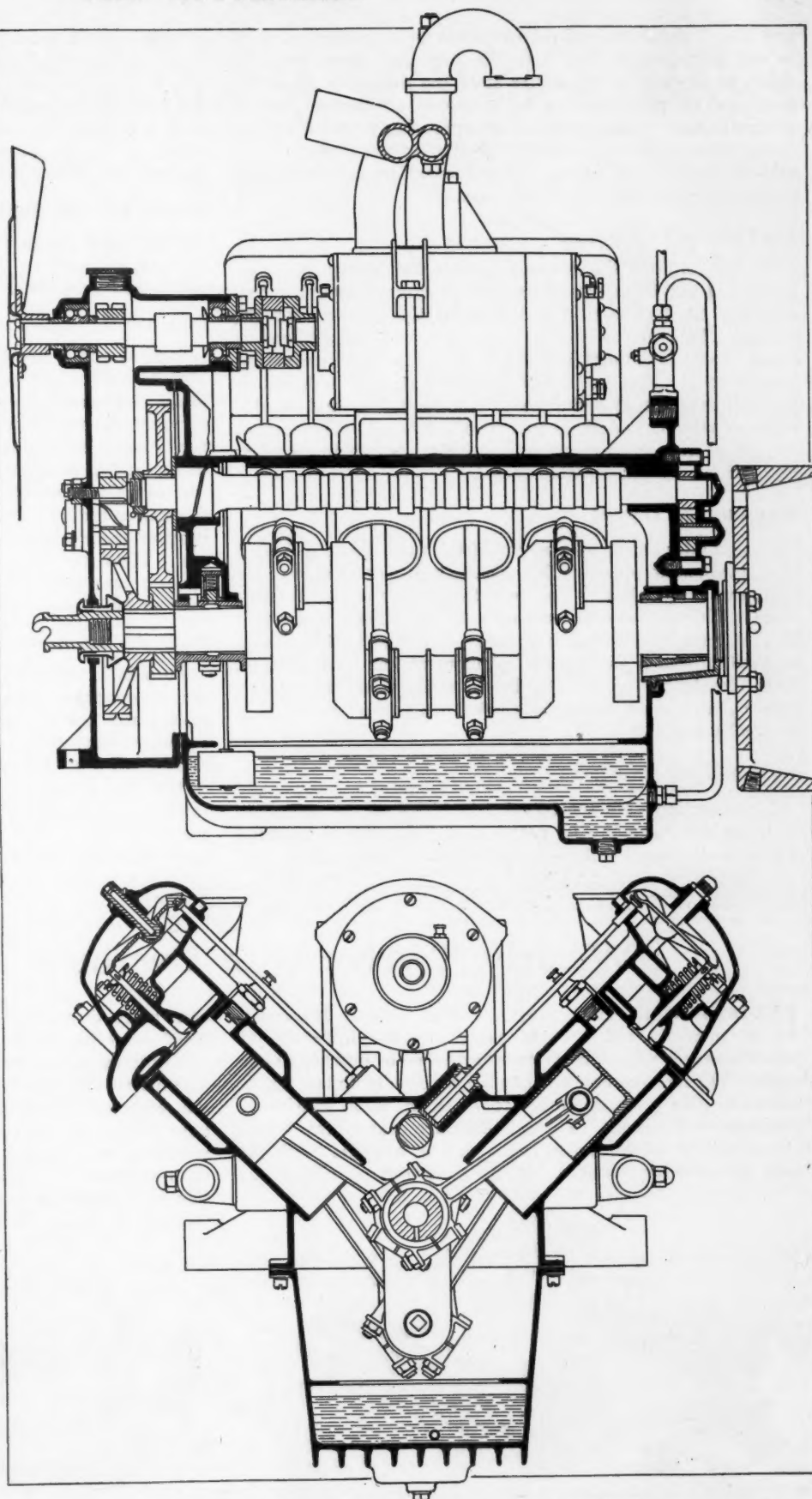
As I write this, I have on my desk a valve just taken out of a motor of this type which has gone through a 300-hr. endurance run. The motor was operated at about 1550 r.p.m. and developed at that speed about 35 b.h.p. Not only is this valve not carbonized and not pitted, but as far as may be determined by inspection, it is ready to go back into the motor for just such a run. The original marks made by grinding-in are still evident to the eye.

The detachable head secures an additional advantage: it permits a perfectly symmetrical combustion chamber with completely machined walls, and these smooth walls naturally present less opportunity for carbon deposit than do the comparatively rough walls of a casting. Practically all of the foundry problems are those which come up in connection with the comparatively small head casting.

Between the detachable head casting and the cylinder blocks there may be used the flat armored asbestos gasket, or if it is desired, the soft copper circular gasket. With properly located studs, either of these gasket arrangements may be made satisfactory.

V-Type Possibilities

Comparison of Figs. 1 and 3 show the possibilities of refinement in overhead-valve operating mechanism. Fig. 3 is a typical section of the older journal-type of rocker



Upper—Fig. 6—Longitudinal section through two-bearing, eight-cylinder V motor of the valve-in-the-head Brush-developed type

Lower—Fig. 7—Transverse section through the motor mentioned in Fig. 6. From the repairman's standpoint the fact that the valves are seated in an easily detachable head is of great advantage. For example, when the heads of the two blocks are removed, the valves may be ground in on a work bench where, by inspection, the workman may know whether or not he is doing a first class job. While the heads are off, if it is necessary to take out a piston and connecting rod for any purpose this may be done through the top of the cylinder bore

and Fig. 1 shows the refined fulcrum-type of rocker. I wish to call attention in Fig. 3 to the fact that there must be either in the end of the rocker or in the push rod, as shown in this case, provision for valve tappet adjustment, which naturally adds to the weight of the operating parts. Furthermore, when wear occurs in the journal in the center of the rocker, there is no means of compensation for this wear except by re-bushing the rocker arm.

The Fulcrum-Type Rocker

In Fig. 1, with the fulcrum-type rocker shown in detail in Figs. 4 and 5, tappet adjustment is secured by raising or lowering the hollow stud which forms the fulcrum for the rocker. This means that whenever tappet adjustment is made, there is automatic compensation for any wear that may have occurred in these operating parts. Furthermore, the well shaped seat in the rocker and the hollow stud provide capacity for a considerable amount of lubricant. The amount of oil contained in these parts is sufficient to provide lubrication for a very considerable period.

Adjusting the Tappets

Tappet adjustment on a motor of the type shown in Fig. 1 is a very simple process. The lock nut outside the cover for the valve mechanism is loosened; the stud is screwed downward while the motor is running until the push rod can just be freely revolved with the fingers. The stud is then locked in position and a satisfactory adjustment has been secured. This developed valve-in-the-head mechanism is lighter, quieter, and more easily assembled than the cruder type originally used.

Valve-in-Head Advantages

In connection with the recent popularity of the V motors it is decidedly worthy of notice that the valve-in-the-head presents some very material advantages. It is the only type

of motor which permits the exhaust manifold to be placed on the outside of the V, where it is entirely out of the way when inspection or adjustment of accessories is necessary. It is the only type of motor which in V construction makes possible a tappet adjustment that is accessible, the adjustment being in the top of the head cover instead of down inside the V.

Interior of V for Accessories

This leaves the interior of the V free for intake manifold, carbureter, ignition distributor, and, if desired, starting motor and generator.

From the Repairman's Viewpoint

Figs. 6 and 7 are two sections through an eight-cylinder, V motor of the valve-in-the-head developed type. The valve-in-the-head naturally retains in V construction the efficiency inherent with this type of motor. Furthermore, from the repairman's standpoint the fact that the valves are seated in an easily detachable head is of remarkable advantage; for example, when the heads of the two blocks are removed, the valves may be ground in on a workbench, where by inspection the workman may know that he is doing a first class job. While the heads are removed, if it is necessary for any purpose to take out a piston and connecting-rod, this may be done through the top of the cylinder bore.

Simplicity and Economy

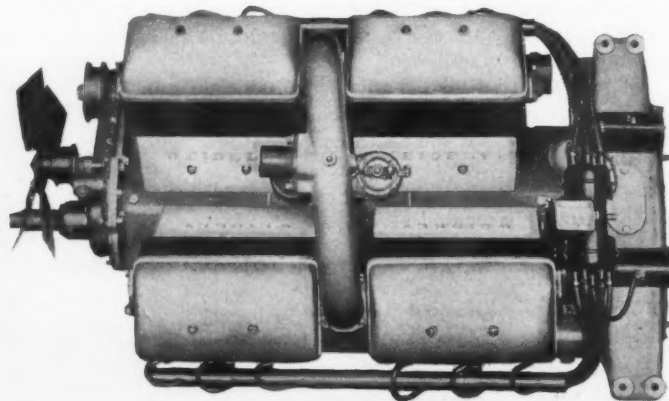
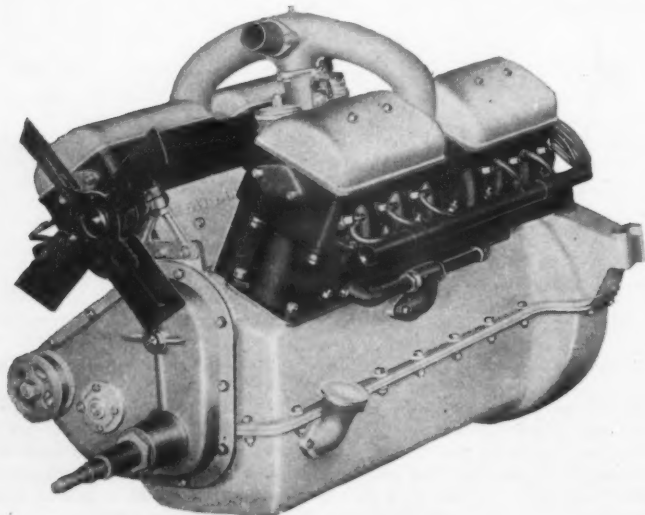
To sum it all up, this type of motor may be completely and thoroughly overhauled without removing the cylinder blocks from the chassis, and there are no parts or accessories so placed that before they can be inspected other parts or accessories must be removed. These advantages are secured in this type of valve-in-the-head motor, not only without adding complications, but with in reality an increase in simplicity and reduction in cost over other types.—W. A. BRUSH, Business Manager, The Brush Engineering Association.

Weidely Twelve with Overhead Camshafts

INDIANAPOLIS, IND., Aug. 16—The Weidely Motor Co. of this city has brought out a twelve-cylinder motor which operates under the Weidely principle of overhead camshaft. The new power plant has 2½ by 5 in. cylinders and is stated to give a speed from 2 to 75 m.p.h. when fitted to a passenger car chassis. The cylinders are cast in two blocks of six each with the motor heads cast in a single block for each set of three cylinders. A liberal use of aluminum has

been made throughout the motor, the crankcase being a divided aluminum design and the pistons also of aluminum alloy.

Lightness is one of the main features connected with the new motor, and this has been carried through particularly in the reciprocating and oscillating parts. In addition to aluminum pistons seamless steel tubular connecting rods aid in the reduction of vibration at high speed. The crankshaft is 2½ in. in diameter and the flywheel is a steel forging. Lubrication is by pressure feed. It is intended to put these motors through on a regular production schedule.



Left—Three-quarter front view of Weidely twelve motor
Right—Plan, showing carburetor mounting and ignition wiring

British Give Cars for Ambulance Work

**Donated Passenger Cars Converted
Into Field Trim
and Turned Over to French Military
Drivers—Formed
In Convoys of 20 to 40—50,000
Wounded Carried in Vosges Mountains**

PARIS, Aug. 1—In the brief interval between a trip to the front, from which his automobile returned with a bullet hole through the front fender, and a visit to an artillery factory where experiments were made with new explosives, President Poincaré formally inspected a fleet of ninety automobile ambulances presented by the Automobile Association and Motor Union of Great Britain to the French army.

The ceremony took place in the courtyard of the Invalides with the golden dome of Napoleon's tomb as a background and captured aeroplanes and cannons as decorations. The audience was capable of being produced by war alone: French soldiers and officers in a variety of uniforms; English staff officers in khaki; American ambulance men in the same colored cloth; burly Russian officers; Belgians in the new khaki uniforms which appeared to have been borrowed for them; and English civilian officials in immaculate top hat and frock coat.

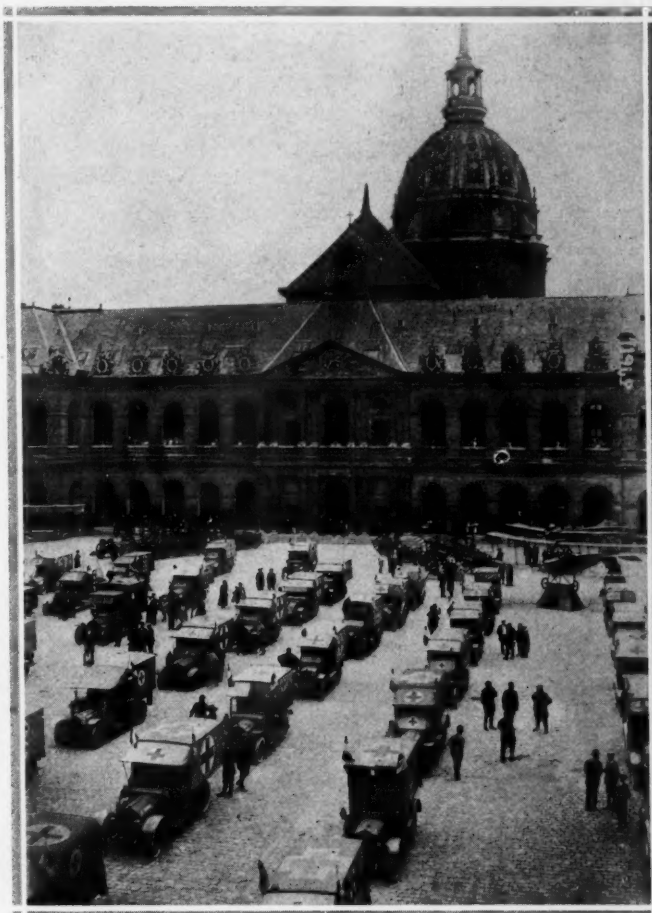
All Private Touring Cars

For several months the Automobile Association and Motor Union has been making appeals to its members for automobiles or subscriptions to buy automobiles to be presented to the medical service of the French army. The number of persons who must have parted with their cars is considerable, for the ninety machines inspected at the Invalides represented only a portion of those put into service under these conditions, and they had all been private touring cars. Every European make was represented—English, French, Italian and German, with English predominating. The passenger car bodies had been stripped off and replaced by a uniform type of ambulance body carrying four men lying or eight sitting.

French Drivers Take Charge

The English effort comes to an end with the delivery of the ambulances to the French army authorities. Each car is put in charge of a French military driver and convoys of twenty to forty are formed with the necessary officers taking their orders from the chief doctor. The ambulances are sent out to different points just to the rear of the battle line, where they are made use of in carrying wounded from the dressing stations to the clearing hospital. Except in very rare cases, these automobiles are not used for long trips. They are employed as auxiliaries to the railroads: bringing men from the dressing stations to the military hospital; carrying them from the hospital to the hospital train; taking men from the train to the base hospital. Wherever they are placed the work is apt to be spasmodic. For a week or more there may be nothing to do, then, following fierce fighting, men and machines may run backwards and forwards without a stop for 48 hr. or more.

One of the features of the English automobiles is a very successful type of traveling kitchen mounted on a 30-hp. Fiat chassis. It is designed to handle big quantities of light re-



English automobile ambulances in courtyard of Invalides, Paris. In the background are captured aeroplanes and cannon. Here President Poincaré of France formally inspected the ambulances

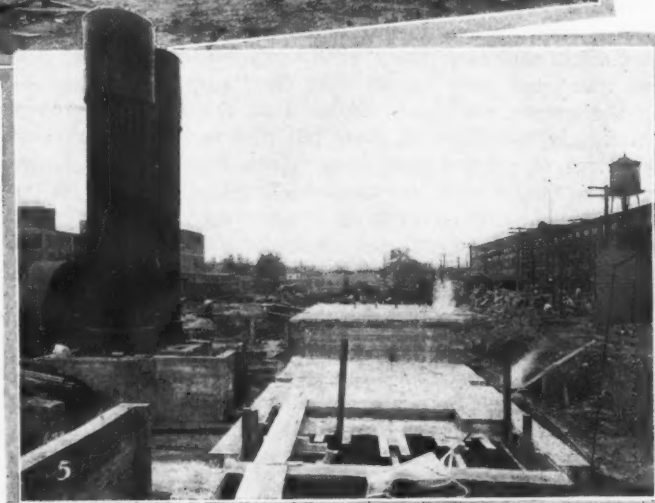
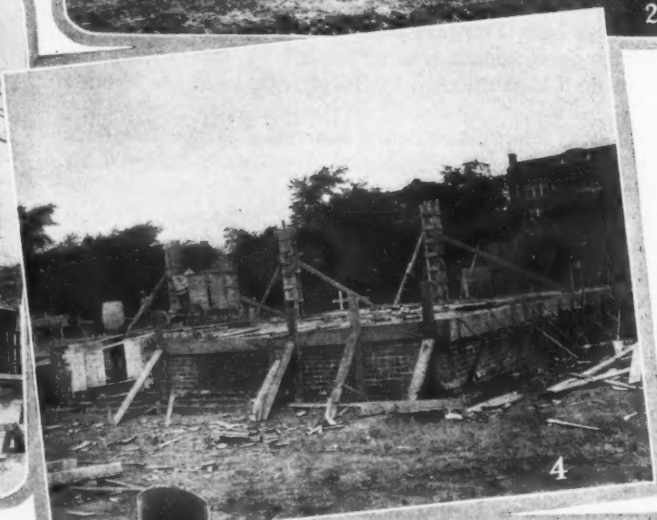
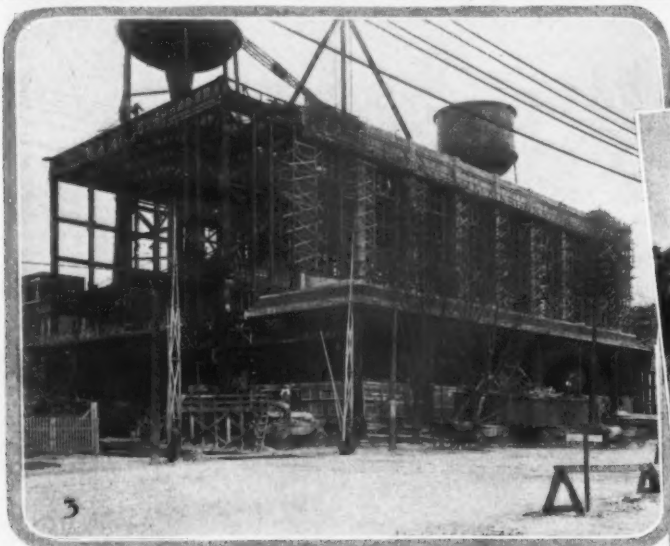
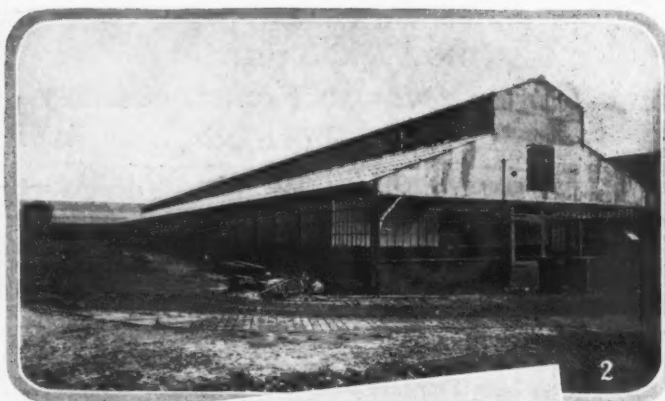
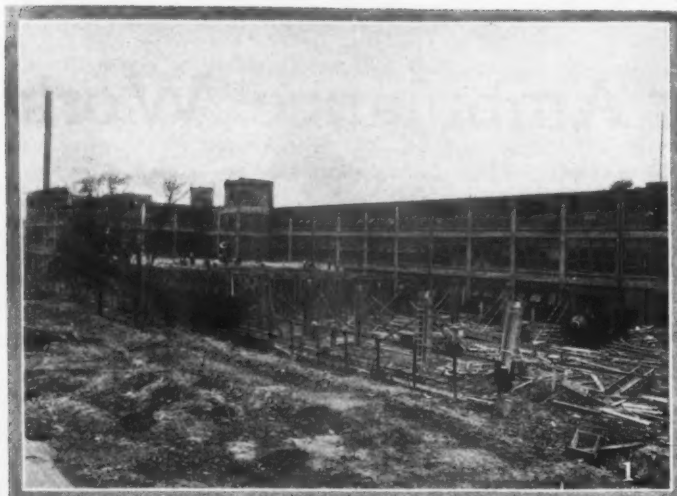
freshments, such as coffee, tea, cocoa, bread and butter, etc., to the men who have just come out of the firing line, are temporarily cut off from their food supply, or have come off a long railroad journey. Across the front end of the body is the cook stove, with kerosene as fuel, and the washing sink to which water is pumped from a tank; down each side is a table with food cupboards beneath and plate and mug racks above; across the rear is a folding counter over which the food is passed to men outside.

In the Vosges mountains, where railroads are scarce and the automobile is the only reliable means of locomotion, there are twenty-four sections of British ambulances with the French troops. In this district all the work is done over high mountain passes. Since these automobiles went into service towards the end of last year they have carried more than 50,000 wounded.

Regularly Inspects Cars Sold

LOUISVILLE, KY., Aug. 14—The Southern Motors Co., this city, agent for the Packard, Hudson, Dodge and Detroit electric employs an inspector who makes periodical inspection of all machines sold by the concern. During the first year that the car is in the hands of its new owner, this inspection is made free of cost. Repairs which in the wisdom of the company appear to be owing to the owner also are made without charge. A nominal sum of \$3 is charged for inspection after the first year.

Detroit Plants Make \$5



DETROIT, MICH., Aug. 16—The prosperity of the concerns centering about Detroit engaged in the manufacture of automobiles, trucks and accessories is such that twelve concerns have either finished or are about to complete additional buildings which will provide more than 850,000 sq. ft. additional floorspace. The cost of these additions is well up toward the \$5,000,000 mark, according to the estimates given by the twelve concerns, eleven of which total to \$4,546,000.

The concerns included in this total are the Packard Motor Car Co., Paige-Detroit Co., Timken Axle, Chalmers Motor, Rands Mfg. Co., Federal Motor Truck, Hyatt Roller Bearing Co., Ford Motor Co., Hudson Motor Car Co., Dodge Bros., Kelsey Wheel Co. and Continental Motor Mfg. Co. The additions in detail are:

Paige-Detroit Motor Car Co.—Addition to assembling plant and also warehouse for materials in the same building. Will be 4 stories high, 312 by 64, or 74,880 sq. ft. Was started in July, to be completed in November. Expenditures about \$200,000.

Total floorspace of plant will be 464,880 sq. ft.

Dodge Bros.—Test shed—storage and final inspection of cars. One story, 380 by 60, 22,800 sq. ft. Started in April, completed in August, to cost \$25,000. Additions to Dodge plant have been under way since last year and represent an expenditure on buildings alone of several hundred thousand dollars.

Ford Motor Co.—Power house, 250 by 150. Started in April, 1914, will be at least 6 months before completed. Building to cost about \$1,000,000. With full equipment power plant represents an investment of between \$2,000,000 and \$2,500,000.

Hyatt Roller Bearing Co.—General office building for the automobile division only. Three stories high, 100 by 60, or

1—\$200,000 addition to assembling plant of Paige-Detroit Motor Car Co.

2—Dodge Bros. test shed, storage and final car inspection. One of many additions to this company's factory

3—Ford Motor Co.'s new power house, which with equipment represents an expenditure of between \$2,000,000 and \$2,500,000

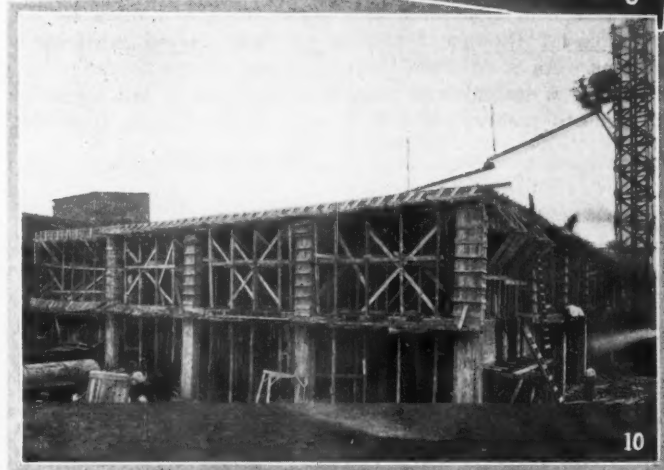
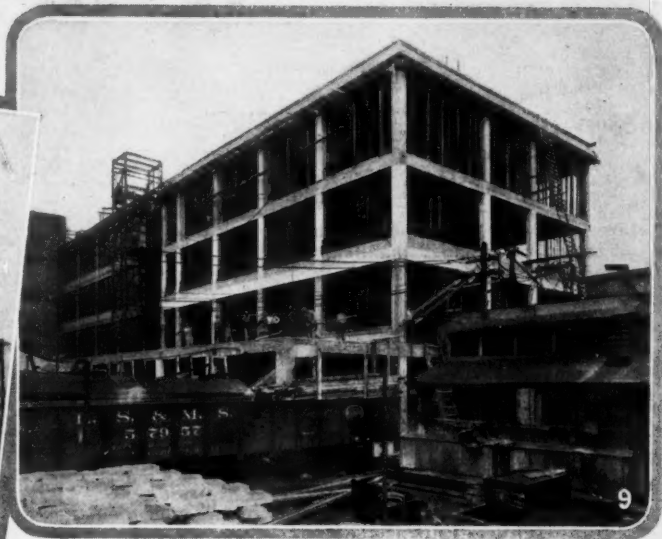
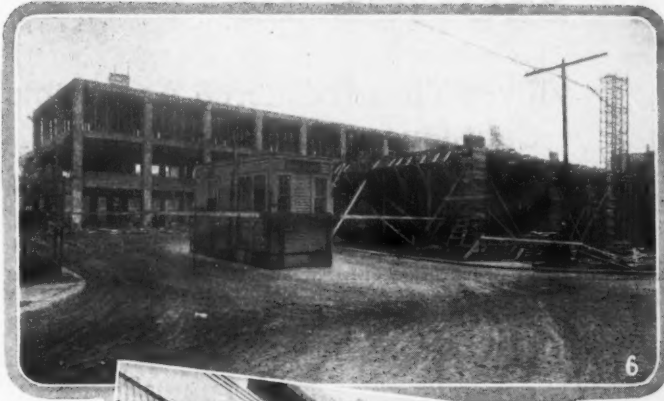
4—Hyatt Roller Bearing Co. new office building for automobile division only. It will cost \$60,000

5—Beginnings of Timken-Detroit Axle Co.'s new drop forge plant, which will cost \$240,000

18,000 sq. ft., to cost \$60,000. Started in July, to be completed in November.

Timken-Detroit Axle Co.—Where new drop forge plant will be located. One-story building, having 16,100 sq. ft. floor-

\$5,000,000 Additions



6—Top, body and finished car building and employment department structure which form part of the Hudson Motor Car Co. \$1,000,000 additions

7—Truck assembling and machine additions to the Packard Motor Car Co. factory

8—Service and stock department addition to Federal Motor Truck Co. plant

9—Addition to Chalmers Motor Co. machine and manufacturing building, one of several instances of expansion at this factory

10—Windshield plant of Rands Mfg. Co. is adding 20,000 sq. ft.

space. Will cost when completely equipped \$245,000. Started in May, to be completed in September.

Other additions to plant being erected. Expenditures on buildings alone \$225,000.

Hudson Motor Car Co.—Large building in rear, three stories, 500 by 60, 90,000 sq. ft. To be top and body and finished car building.

Building in front, three stories, 400 by 60, 72,000 sq. ft., to be employment department on first floor, addition to machine shop second floor, and third floor undecided. Work started in May, to be ready in October.

Present other additions to Hudson plant include an additional floor to all two-story buildings and also the lengthening of these buildings. There is also to be a new six-story building. Total expenditure on buildings and equipment is to be between \$1,000,000 and \$1,500,000.

Packard Motor Car Co.—In the foreground is a steel frame shed addition to the assembling truck department, 240 by 240, or 57,600 sq. ft. Building in rear, addition of one floor 240 by 60, or 14,400 sq. ft., to truck machine building.

Total additions to the Packard plant will give 377,000 sq. ft., and bring the total of the plant to 48.1 acres of floorspace. Additions were started in June and are to be completed in November, and the cost will be about \$550,000.

Federal Motor Truck Co.—One-story addition, 168 by 60, or 10,080 sq. ft., to be used as service and stock room.

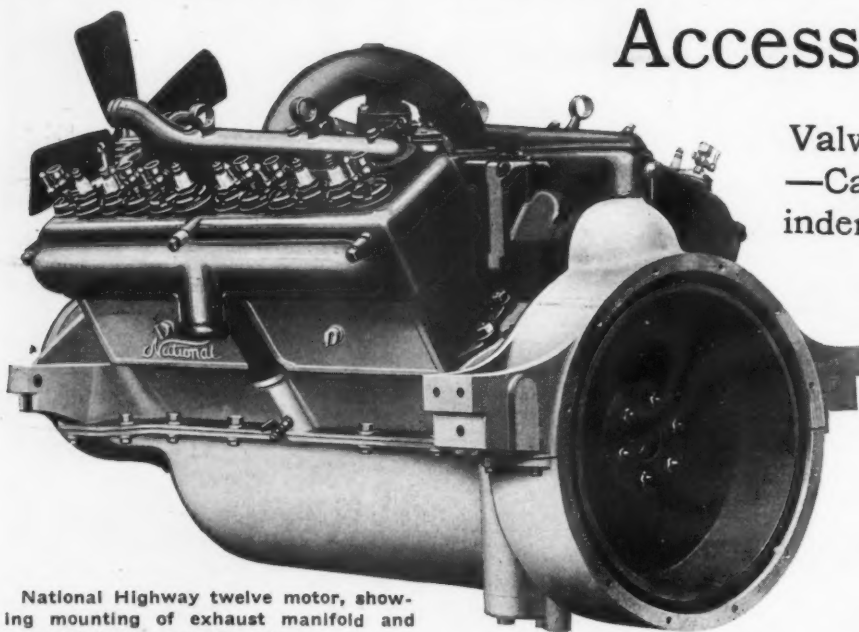
Chalmers Motor Co.—Four-story addition to the machine and manufacturing building. Will total 24,300 sq. ft. of floorspace. Started in July, to be ready in September. Cost about \$40,000. Other additions to plant will make total cost \$125,000 and increased floorspace all told 50,000 sq. ft.

Rands Mfg. Co.—Two-story addition, 153 by 65, 20,000 sq. ft. floorspace to windshield department. Started in July, to be completed in September. Expenditure \$26,000.

Kelsey Wheel Co.—Adding a new press and stamping building, 325 by 80, and two floors on another building, all told 78,000 sq. ft., to cost about \$250,000.

Continental Motor Mfg. Co.—Additions are being made to the assembling room, block test department and heat treating department. With other additions, these represent 55,000 sq. ft., the cost of the buildings being \$150,000.

National Twelve Valves Outside— Accessories in V



National Highway twelve motor, showing mounting of exhaust manifold and cover plates for outside valves

A NATIONAL Highway twelve has been on the road for many months and a few privileged persons were taken out in it, by the National Motor Vehicle Co., Indianapolis, Ind. Like other V-type multi-cylinder motors it has a great high-gear ability and combines smoothness with rapid acceleration in a marked degree. The car has all the character that has made the National six what it is to-day after 10 years of development, only it has a good deal more power in proportion to its weight.

The motor is not so very large from a volumetric viewpoint, being 2.75 and 4.75 bore and stroke, giving a piston displacement of 338.5 cu. in. and an S. A. E. rating of 36.26 hp. The wheelbase measures 128 in. and the body, of standard touring type, is seated for four, with folding seats for two more. The manufacturers describe it as providing ample room for six passengers and close room for seven.

Accessibility Conspicuously Good

The motor embodies all the best features of modern high-speed design and the use of outside valves; the first example in V designs was suggested by the much better accessibility given by this position, and by the convenience of having the electrical gear and other motor accessories in the V, where their individual accessibility is maximum.

The cylinders are cast in blocks of six and are of conventional L-head design with small combustion chambers. Two camshafts are necessary, but there is no need for rockers or other devices to synchronize the valve action, as the valve operation for either set of cylinders is totally unaffected by

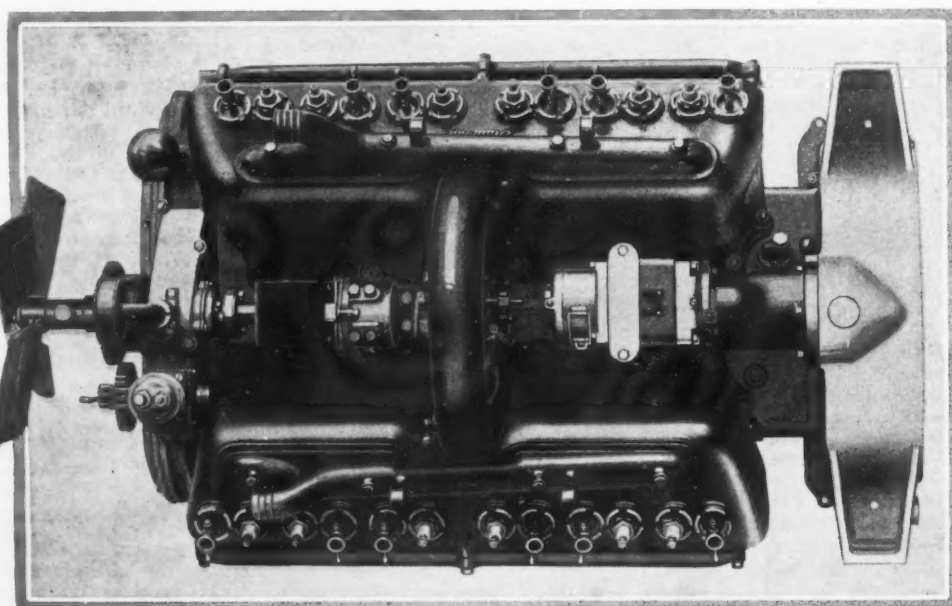
Valves Thus Rendered Accessible
—Cantilever Rear Springs—Cylinders Have Separate Oil Feed

the other set. At the front helically-cut timing gears drive the camshafts as in a T-head motor with vertical cylinders, and for the drive to the Splitdorf magneto a silent chain runs from the right camshaft to the fan pulley spindle. This magneto is a special Splitdorf.

In the rear of the V is the Westinghouse starting motor, and the generator is located alongside the crankcase, being the only attachment not within the V. For the connecting-rods the side-by-side design has been chosen, the cylinder blocks being staggered 1 in. to permit of this.

The lubrication system is unusually complete as there is practically no moving part that does not receive a direct supply from the pump. The latter, a gear type, is located in the oil base, having a large screen on the suction side and also a gauze strainer in the form of a tray covering the whole top of the oil pan, but there are no dip troughs as the crankshaft is fully drilled and the oil from the main bearings finds its way to the connecting-rod lower ends.

Separate pipes lead to the timing gears and to each of the camshaft bearings while the piston pins are oiled by an inversion of the usual method of fully forced lubrication systems. As a rule the connecting-rod serves to carry the oil to the wristpins and then to the cylinders, but here the oil feeds to each cylinder at a point about 1½ in. from the



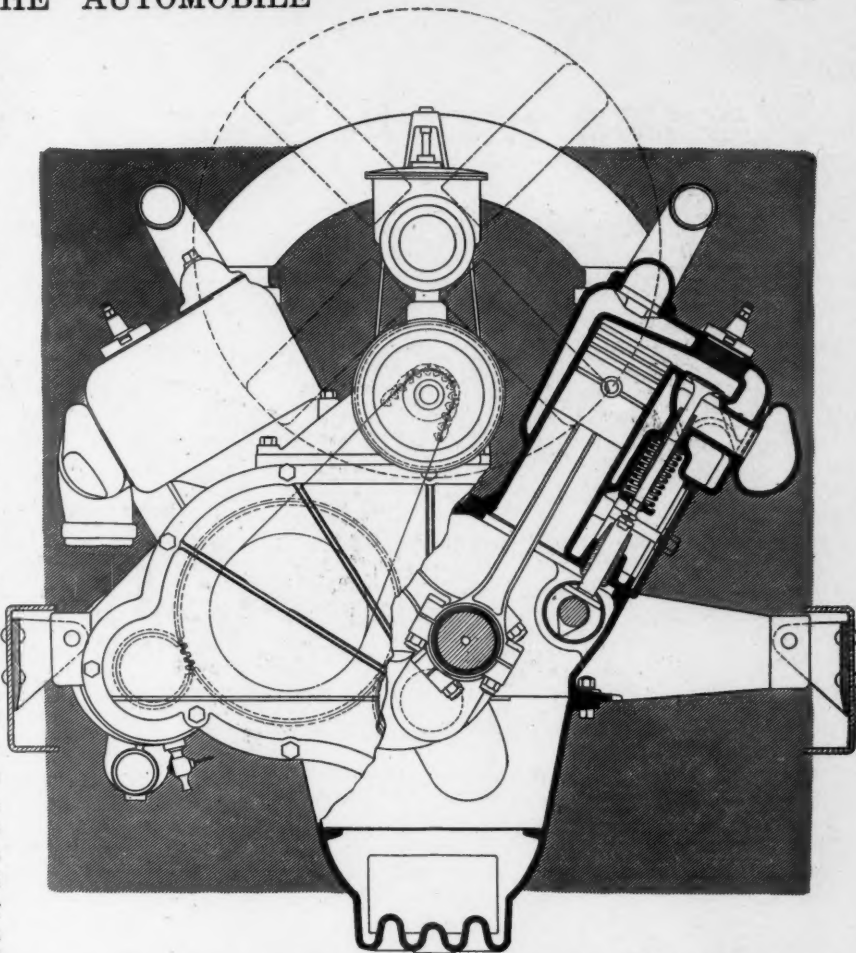
Plan of National twelve showing mounting of the carburetor and electric units in the V with transverse intake manifold. Note water outlet manifold mountings

bottom and reaches the wristpins through tiny holes drilled in the aluminum pistons. The latter have a V groove cut near the bottom, which is used to lift oil into the cylinder, as the absence of splash troughs in the body of the crankcase cuts down the amount of spray present. As to the oil pressure, this is not very high, the relief valve blows off at 25 lb. per sq. in. When the engine is idling the pressure is about 10 lb., and it rises gradually with the speed till the limit is reached.

There is only one water pump, but this is duplex internally, the rotating member carrying two sets of vanes. One set feeds directly upward into the block of cylinders on the right and the other half of the pump delivers through a passage cast in the aluminum of the crankcase to the left block. This cuts down the piping materially and makes for efficiency and simplicity.

A few other facts about the engine that are interesting may be given, as for instance the weight of the pistons, which is 8 oz. without rings. The valves are $1 \frac{5}{16}$ in. diameter and the lift is $\frac{3}{8}$ in., giving a quite large opening, while the mushroom tappet provides a quick lift and descent, giving a slightly better valve diagram than the roller type. It is probable that the fan has some effect as a damper to the crankshaft, though it is doubtful whether any such aid to elimination of vibration is needed, but the short belt drive, when kept tight, provides a flywheel just as the Lanchester device, with a slipping possibility. Of course reaction from the fan would be cushioned a good deal by the belt and then the chain, but it is an undoubted fact that the presence of a fairly high speed fan does often have a steadying effect on a motor.

Aft of the motor there is little in the chassis, if anything, that differs from the Highway six described in THE AUTOMOBILE for May 27. The clutch is an aluminum cone with leather face and the unit gearset provides three forward speeds, all shafts therein running on annular ball bearings. The propeller shaft is tubular and bears two universals, and the rear axle is floating. On both the six and the twelve



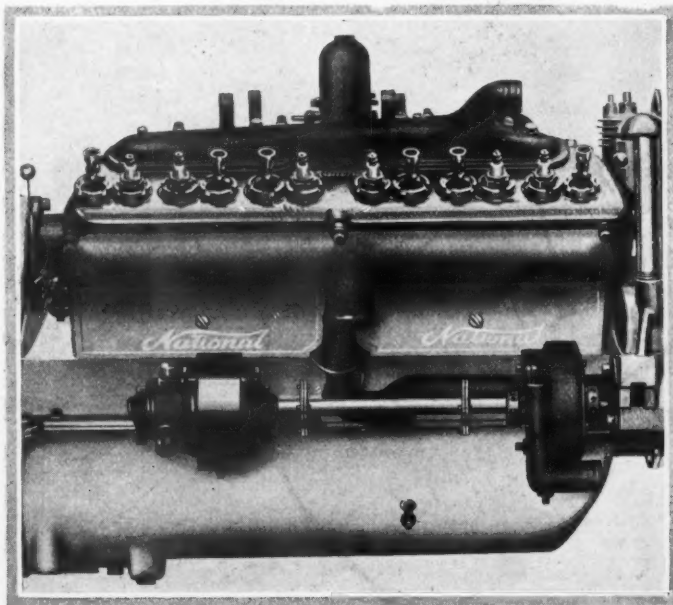
Section through National twelve, showing how the outside valves are actuated and also giving an idea of the water jacketing space and exhaust manifold mounting

a flat cantilever rear suspension is employed and it may be noticed that the center bracket has the swivel pin located beneath the spring, instead of above it as is more usual. The springs are 51 in. long and $2 \frac{1}{2}$ in. wide with eight leaves each and their action is extremely satisfactory. The front springs have no noteworthy peculiarity, being 38 in. long by 2 in. wide, but special precautions have been taken in laying out the steering and the use of large ball thrust bearings for the front axle swivels makes the steering control very facile.

Throughout the rear axle taper roller bearings are used, and the type is floating, very strong steels being used so as to cut the weight as much as possible. This statement applies to the whole chassis which has few redundant parts and very little dead weight in any portion. Drive is by spiral bevel and the top gear ratio is 4.4 to 1. It should be added that the twelve-cylinder engine is made throughout in the National plant at Indianapolis as the shops are well equipped for the production of a moderate number of high class motors.

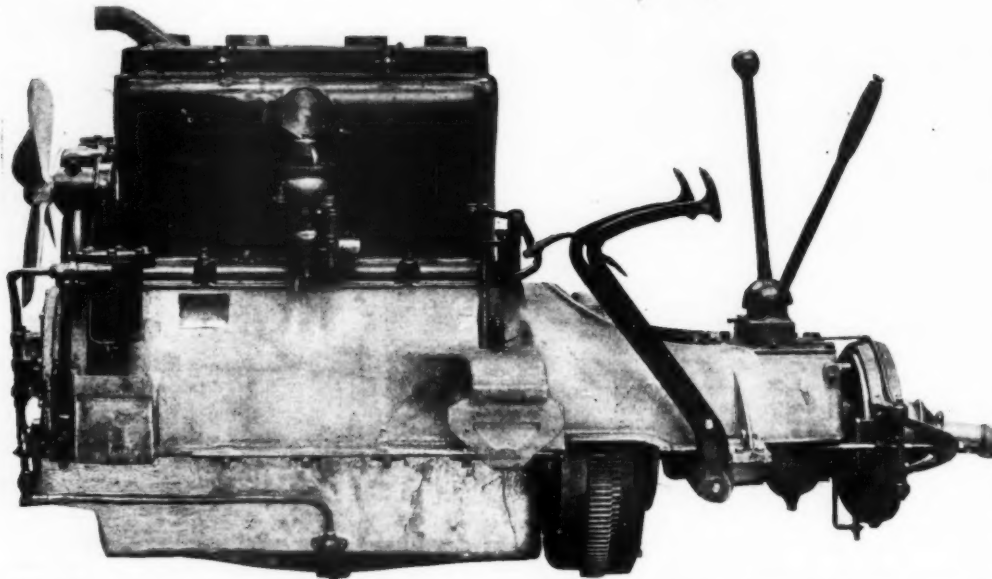
Brakes 15 by 2 In.

In general the body is like that which drew so much comment at the national shows this year, having the divided front seats and the smooth lines which the National company was among the first to introduce to America. Without the least hesitation it is safe to say there is no car in Europe that is better appearing than the touring National, either six or twelve, and for comfort it can vie with the best. In equipment the car is well provided, having speedometer, one-person top and all the usual accessories, while the four tires are each 36 by $4 \frac{1}{2}$ in., which should be large enough for the high power, when the light weight is remembered.



Right side of National twelve, showing mounting of pump and generator, the only motor accessories not located in the V

Stearns Small Four Uses Westinghouse



Stearns small four power plant, showing oil filler beside fan bracket. Also contracting service brake operating mechanism. The brake is mounted behind the gearbox

THE F. B. Stearns Co., Cleveland, Ohio, created a good deal of interest a year ago by introducing a new small four at \$1,750, the design being extremely modern. This car now sells at \$1,395 as announced some weeks ago. For 1916 the big Stearns development is to be the eight-cylinder with Knight engine which will be ready shortly, but meanwhile the small four has been put into regular production and the factory is ready to deal with it in quantities. Building extensions which were commenced in the early spring have been completed for some time and the much needed additional space is now fully occupied.

It is the getting into stride with the new four that has enabled the drop in price to be made as quality has not been cut in either chassis or body. There are three changes, the most important being the employment of a Westinghouse two-unit system of electrical equipment and the adoption of battery ignition and the other a small change in the design of the torque rod which increases its strength by giving a larger bearing at the front end where the forward extremity is secured to the frame by a spring hanger.

Complete Lubrication

The motor, $3\frac{3}{4}$ by 5%, has a displacement of 248 cu. in. and an S. A. E. rating of 22.5 hp. This figure does not represent the true power as the long stroke produces a much higher piston speed than the 1000 ft. per min. on which the formula is based. A neat block casting is used for all four cylinders, and the engine has the fully forced system of lubrication introduced last year. Oil is pumped to the three main crankshaft bearings and thence passes to the crankpins. From here it is led up the hollow connecting-rods to the wristpin bushings, while spray of escaping oil from the various bearings cares for the sleeves and the other motor parts. It is proved by the records of the company that bearing troubles are very uncommon with Stearns cars as the number of replacement bushings asked for is extremely small, and, of course, this is a direct measure of the efficiency of the lubrication.

Another change is the substitution of timer ignition for the magneto originally used, the distributor being situated at the front of the engine beside the fan bracket.

**Battery Ignition
Adopted—
Torque Rod Stronger
—Price Now \$1,395**

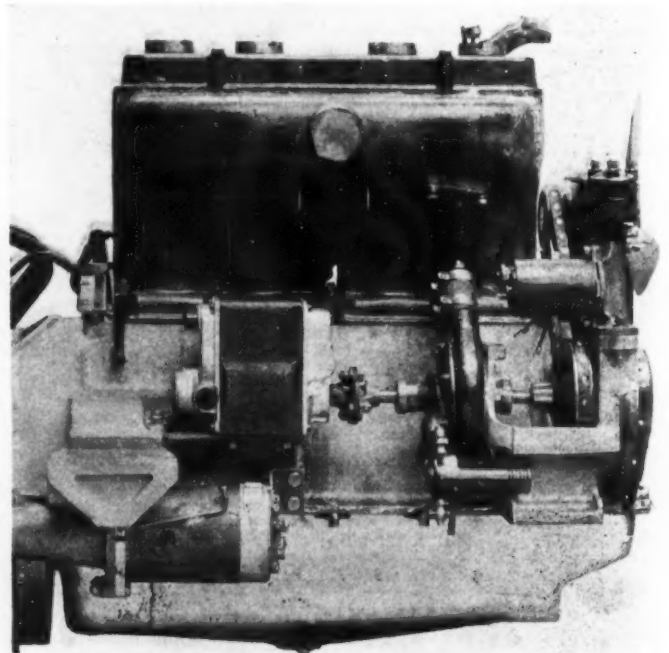
Mention of the fan draws attention to a very ingenious small feature of Stearns design which is that the lubrication of the fan spindle is automatic. It may be seen in the illustrations that the oil filler is located alongside the fan bracket and all oil for the motor is put in through this cap. Inside the strainer is a wick having one end in connection with the fan bushing, and this wick becomes saturated with oil each time the

crankcase is filled, so attending to the fan lubrication with sufficient frequency.

The location of the generator and the starting motor are also shown in the illustrations, and it needs only to be added that the latter has a Bendix flywheel engagement. The oil pump is located at the front end of the eccentric shaft, and a silent chain is employed for the generator and water pump drive.

Transmission Brake a Feature

The clutch is a leather-faced cone with powerful cushion springs to make the engagement gentle, and a really adequate clutch brake is fitted to make gear shifting as easy as possible. Actually the gears are extremely easy to handle



New Westinghouse electrical equipment of the Stearns light four

though the low-speed ability which is characteristic of the Knight motor makes the high gear available for nearly everything.

One of the most successful features of the Stearns light four has been the contracting brake behind the three-speed gearbox, this having extremely smooth action combined with great power. In the left side view of the power plant the action of this brake operation is shown clearly. The two shoes hinge on the opposite sides of the drum and their free ends bear small rollers. Inclosing these rollers is a triangular, hollow cam which depression of the pedal pulls forward, so closing together the ends of the brake shoes. The separating spring spreads the shoes and also puts a light release load upon the rollers, the cam, and so to the pedal, the effect being that there is no point in the whole of the brake layout where slack can develop and the creation of a rattle is thus impossible. The emergency brakes are of expanding type.

Spiral bevel drive is employed and the axle is a floating construction containing a very full equipment of radial and thrust ball bearings, while a torque stay of pressed steel takes the driving and braking torsional stresses. Propulsion is through the springs which are 50 in. long by 2½ in. wide and of cantilever type: the wheelbase is 119 in.

There are five body styles to choose from, a five-passenger touring car, roadster, three-passenger cabriolet, sedan and



Stearns-Knight small four which lists at \$1,395

seven-passenger limousine. Roadster and touring car both cost \$1,395, the cabriolet \$1,900, and limousine \$2,500. As to equipment this is complete and of the best quality. The upholstery is hand buffed leather and all the body fittings are the highest class.

Lighting is cared for by double-bulb headlights, tail light and a cowl board bulb. Four 34 by 4 tires are used with a spare demountable rim. The carbureter is made specially for the Stearns motor and fed by gravity from a cowl tank.

Cameron Six Touring or Roadster \$1,000

THE Cameron Mfg. Co., New Haven, Conn., will produce for 1916 a six-cylinder chassis of 122-in. wheelbase and 33 by 4 wheels with two styles of body, a five-passenger touring and a runabout with an inclosed seat in the rear which makes it in reality a four-passenger car when opened.

The motor is 3 by 5 block design of conservative construction. At a speed of 2000 r.p.m. it is stated that 40 hp. is delivered on the block and the weight of the motor is said to be less than 9 lb. per horsepower. The crankshaft is carried on three bearings and is 1¼ in. in diameter. The bearings are all bronze backed with nickel babbitt lining. The connecting-rods are 9 in. long with their lower bearings 1¼ in. in diameter by 2 in. length. The upper bearings are ¾ in. diameter with 1¼ in. length on the wristpin.

Lubrication is taken care of by a plunger pump operated from the camshaft which takes the oil from the compartment in the lower part of the crankcase to an oiltight compartment surrounding the camshaft. The pressure is sufficient to hold the valve lifter against the valve, thus even with clearance the clicking of the tappets is avoided.

The one-piece camshaft is driven from the crankshaft by helical gears of eight-pitch with 1-in. face. The camshaft gear is bolted to a flange forged on the end of the camshaft.

The water pump is gear-driven and the shaft extends through to drive the Atwater Kent timer distributor for ignition.

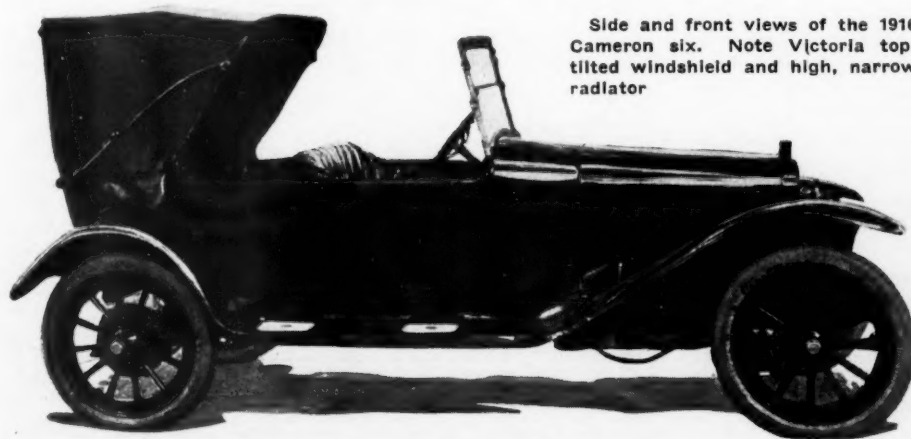
A Splittdorf-Apple starting and lighting system is provided in which a single unit motor generator mounted at the front of the crankcase is driven by silent chain inclosed in the gearcase. The starting switch is the flywheel housing.

Fuel is carried in the tank contained in the cowl, giving a direct gravity feed to the carbureter. This instrument is a 1¼-in. Zephyr and can be primed or adjusted from the seat.

The clutch is an aluminum cone faced with special tanned leather and inclosed in a housing which carries the pedals and receives the radius tube from the rear axle upon which the three-speed gearset is mounted.

The rear axle is floating and the bevel drive and differential are mounted on annular ball bearings and the drive at this point provides a reduction of 3.75 to 1. The two foot-operated brakes are 12 in. in diameter.

The windshield is tipped back on an angle of 15 deg., and the car is provided with a Victoria top over the rear seat which can be thrown back if desired or fitted with curtains which fasten to the windshield in rainy weather. Both touring and roadster are fully equipped and sell for \$1,000.



Side and front views of the 1916 Cameron six. Note Victoria top, tilted windshield and high, narrow radiator



Aluminum in Automobile Chassis

Saves Weight Cheaply—Steel Prohibitive on Price

By A. Ludlow Clayden

DETROIT, MICH.—Editor, THE AUTOMOBILE—There were some remarks in the letter from Finley R. Porter published last week which I, as author of the article on the uses of aluminum, would like to reply to directly. Mr. Porter's main contention is that it is possible to make the lightest automobile by the use of the strongest material only; that is by using steel for everything. As a broad statement this is undeniable simply because if a given *strength* is required high tensile steel of a modern sort will give us the machine with least weight, because steel is stronger than aluminum in a greater ratio than aluminum is lighter than steel.

Efficiency at High Expense

From the efficiency standpoint also, he is probably correct in saying that the most highly efficient motor is obtainable by a generous use of steel. The racing Mercedes which has an all steel engine will probably stand long continued high speed better than any other motor ever built. This motor is practically identical with the Mercedes aeroplane engine that is accepted as being the best in the world to-day. But such an engine is extravagantly costly.

I do not wish to go too greatly into detail, but to mention the cylinders as perhaps the most debatable part, it is thought by many engineers that the success of the Mercedes motor is the even thickness of all its parts and the even cooling that must result therefrom. The steel cylinders of this engine are machined all over, both inside and outside, and cost more apiece than a whole motor of simpler construction. With the aluminum motor the cylinder liner can be steel just as well as cast iron, and there is no necessity to back it with aluminum, the outside of the liner might be in direct contact with the water, so avoiding the junction which, as Mr. Porter rightly points out, is a poor conductor. But it is not the cylinder that gives trouble through getting hot; rather it is the valves and the valve seats. Again, in the Mercedes motor the even cooling of these parts is obtained by the method of machining the cylinder all over and then attaching a sheet steel jacket by welding, a perfect way of doing it but prohibitive for ordinary manufacture. If the valves are contained in the head of the cylinder and this head is aluminum we have better cooling than cast iron would give, and much less weight, for but a tithe of the expense demanded by the all steel construction.

Then, turning to more general matters, in many automobile parts the strength of steel cannot be utilized because we require *rigidity*. Take a crankcase as an example, this could be made very light from steel in the form of sheet and wire or tube. By putting in a tubular member to care for each stress and welding up perhaps a hundred pieces the result would be wonderful, but using a much less strong metal like aluminum enables almost the same weight to be attained with an infinitely greater simplicity.

On the subject of aluminum pistons Mr. Porter makes a very definite statement which is not in agreement with the experience of several other engineers. The only possible explanation, to my mind, is that Mr. Porter has not had the opportunity of trying the best sort of aluminum piston or that the design of those he has used has been faulty in some way. The outstanding fault of the steel piston is that when

made thin enough to be light it has so narrow a section that it cannot keep cool, and consequently the head reaches a destructively high temperature. With aluminum the thicker section and the better conductivity enable the same reciprocating weight to be attained with much smaller likelihood of trouble, at least such is the experience of many engineers.

It must be realized, however, that sand cast aluminum and die cast aluminum are two very different things. Pistons which fail when sand cast can often be made lighter still in permanent mold form and stand up under treatment much more severe. Similarly with such chassis parts as axle cases. Steel will give the *strength* but not the *rigidity* unless it is thicker than the strength requirement demands, and here too there is a vast difference between sand and die cast aluminum.

With respect to the porosity question raised by Mr. C. C. Hinkley, I would call attention to the fact that Mr. Hinkley bases his criticism on experiments made in 1906. Aluminum to-day is not the same substance as it was then. There are two ways of overcoming the porosity and the best is by die casting. The other is to do as is now done with the experimental aluminum cylinder castings, treat the interior surfaces with a sort of enamel, but once a pattern is selected and got into proper repetition shape there should be no trouble on this score.

In conclusion, I hold no special brief for aluminum and where money is no object whatever the extensive use of steel is undoubtedly desirable, but money is always an object in motor car construction so if we are to make the *average* automobile lighter and keep its price within bounds the use of light material wherever possible seems a better proposition. We can substitute aluminum for cast iron almost everywhere throughout an automobile chassis, without increasing the section, and still have strength and to spare. Design is unaffected, machining is simplified, up-keep cost is reduced, and the extra cost is almost nothing when everything is considered and balanced up.

Expansion Not a Trouble—All 1917 Cars Will Have Aluminum Pistons

By James E. Diamond

Editor, THE AUTOMOBILE—I have read, finding most interesting, Finley R. Porter's contribution to the current issue of THE AUTOMOBILE in which he takes exception to certain premises and conclusions drawn by A. Ludlow Clayden in his recent story Cutting the Weight, in which the more generous use of aluminum is advocated. In a great many ways my views are quite at variance with those held by Mr. Porter, and with exactly the same purpose influencing that gentleman to enter the discussion, I would like to point out wherein I differ with him and endeavor to show why.

Weights of Aluminum and Steel

In the first place, aluminum is not one-third lighter than steel or cast iron, but rather is only one-third its weight, that is, the ratio is not two to three, but one to three. In the second place, I think your contributor has underestimated

the strength of properly manipulated, properly alloyed aluminum. Its strength is greater than that of ordinary cast iron by 3000 or 4000 lb. For purposes of comparison let us assume its strength 20,000 lb., a low figure I am inclined to think that the steel that would be used in most places in an automobile, especially about the motor, would not have a strength of 120,000 lb., which figure is arrived at by assuming the correctness of your contributor's statement that the strength of aluminum is but one-sixth that of modern steel. While alloy steels are much stronger than this, I should judge that the strength of the steel that would be used in most places about a motor would be nearer 60,000 lb. If this is true it immediately follows that a section in aluminum may be three times as heavy, and yet not weigh more than a steel section of equal strength. The question of rigidity here enters. It is undeniable that in many locations about an automobile rigidity is of as much importance as strength. I do not believe there can be any question that in the hypothetical case just mentioned that the aluminum piece would have the greater rigidity.

The Price Question

Mr. Porter grants that "In the case of a low-priced automobile with a comparatively low range of efficiency required, the generous use of aluminum would, without doubt, result in a material gain in efficiency, both in upkeep and roadability." It would seem to me that if this is true in the case of the low priced car, it certainly must be true in the case of the higher priced one.

While the discussion can only remain an academic one, my impression is quite the reverse of Mr. Porter's, relative to the result were two designers of equal ability given free rein to design an automobile of given capacity—it being understood, of course, that each car was to be a commercial proposition, from the standpoint both of price, and of production possibilities—the one to confine himself to the use of steels, and the other free to use aluminum, cast iron, and the milder steels. I am absolutely of the opinion that the latter would produce as light, if not a lighter job, and certainly one better commercially. Further I believe the designer could go over the all steel job and improve it by the use of aluminum in certain places.

Concerning the motor proper, it is stated that the first great handicap is the vast difference in the rates of expansion between aluminum and iron, this prohibiting the employment of sleeves. Incidentally the difference is not so great, after all, being not quite two to one. However, at first glance, it might seem that the point was well taken, but careful analysis I think will show that the part that this really plays is not very significant. As having a bearing on this, let us consider the methods of inserting the sleeves. One method is to machine the sleeve, and bore out the cylinder to exactly the same size, using an arbor press to force the sleeve into place. The other method is to heat the cylinder block to as high a temperature as practicable (higher than the block would ever get in service) then pushing the sleeve into place. It would seem to me that there must be initial tension in both cases between sleeve and cylinder, and that for all practical considerations space between is non-existent, hence a perfect thermal connection between sleeve and block. Since the conductivity of iron is so much less than that of aluminum, much of the heat due to the explosion is going to be retained in the sleeve, with the inevitable result that the sleeve is going to expand. On the other hand, the cylinder wall receiving the overflow of heat from the sleeve is dissipating this heat into the surrounding water, consequently at all times remaining a great many degrees cooler than the sleeve, enough so in fact, not only to equalize the difference in expansion but even to increase the tension existing between sleeve and cylinder. The greater the range of temperatures in the motor the more favorable the conditions for this

type of construction. However, after all, theory for and theory against, may be put aside since there is concrete evidence that this sleeve construction is entirely feasible. Experience has shown that the sleeves become loose at no time, remaining securely in place after long continued service.

The appreciation is general that light weight is at a premium in the aeronautical motor field, and that expense is a decidedly minor consideration. In the light of this, it may perhaps be interesting to know that aeronautical motor manufacturers have taken a lively interest in the aluminum motor, and I believe that an announcement relative to an all-aluminum aviation motor will shortly be made by one of the manufacturers of the highest grade motors in this country.

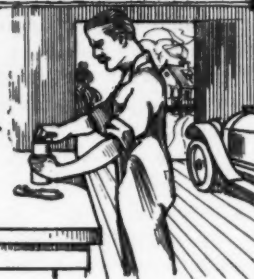
Little may be added about aluminum alloy pistons. Mr. Porter has apparently not had the success with these that most others have had recently. There have been problems in connection with the aluminum piston, but these have been gradually worked out, until it looks as though aluminum alloy pistons would be standard equipment on practically all cars by 1917. The steel piston I do not believe will ever become a commercial proposition; its cost must necessarily always be high, and I have heard of disastrous experiences with this type. As a measure of the success of Lynite pistons, I may say that my company has in hand orders for approximately half a million pistons to be made by the Kotheas process.

I hope that I may be permitted a little more space to consider briefly also the case that Mr. Hinkley makes against the use of aluminum as a material for motors due to the fact that the alkaline waters prevalent in certain sections of the country caused rapid deterioration of this metal. At the time Mr. Hinkley noted this unfavorable condition, back in 1906, aluminum foundries did not know very much about aluminum, and handled it the same as brass was handled. It is doubtful whether the foundry with the, at the time, most advanced methods and practices, could have made a success of the job in question—a crankcase with the gear pump housing integral with the casting—with the alloys and methods then in use, and it is almost if not a certainty that any other foundry would have made a failure of the attempt. I believe that every engineer appreciates the wonderful strides made in the art of casting aluminum, for science it is. The job in question would not offer any particular difficulty to-day. In fact, castings are being made to-day that a year since we should not have undertaken. This question of alkaline waters was considered when the first aluminum motors were built, and to answer which several of these first motors were put in cars and shipped to the alkali regions for test. The first of these have been running for 2 years, and are apparently as good as the day the motors were built. I have yet to see the first aluminum intake manifold returned on account of porosity due to the action of alkaline waters.—JAMES E. DIAMOND, Engineer, Aluminum Castings Co.

Automobiles Raise Texas Land Values

AUSTIN, TEX., Aug. 13—Bankers and business men generally who have been taking an inventory of land values in different parts of Texas recently claim that the automobile is more largely responsible than any other one factor for the increase in the prices of farm and ranch properties during the last few years. The improved mode of transportation has brought the towns and the country into close touch with each other and has made living in the rural districts much more worth while than formerly. In some localities, it is estimated that the increase of land values, due to the automobile, averages more than \$15 per acre. The general average increase of values, taking the State as a whole and embracing about 168,000,000 acres is placed at \$5 per acre, or a total increase approximately of \$840,000,000. This increase is exclusive of that which is credited to ordinary growth.

The Rostrum



Must Not Stretch Perfection Piston Rings

EDITOR THE AUTOMOBILE:—I have recently put a 4-in. Perfection piston ring in my Buick 31, 1913 model. The car had been run about 800 miles. I used five of these small rings to each cylinder, using the old ones for the other two grooves. The compression seems to be greater than it was before I put these new rings in. The mechanic that put these rings in for me said that they would not damage my cylinders, but I have had several mechanics since then to tell me that they would, and that after a little while I would have to buy new cylinders. These are soft steel rings. Would you advise me to have these rings removed and new ones put in or let them stay in the car?

Pine Bluff, Ark.

E. W. H.

—It has been the experience of many patent ring manufacturers that their rings are apt to cut the cylinders. This is not necessarily true, as in most cases where these rings are applied, they do not cut the cylinders. As a matter of course, any article such as a piston ring is subject to the usage which it is put through by the mechanics of the garages and in some cases these piston rings are put on without a careful reading of the instructions and contrary to the method in which they are supposed to be applied. The Perfection piston ring as manufactured by the Automobile Construction & Engineering Co., is supposed to be threaded over the piston instead of stretched over it, and if they are put on in this way, they will give good results. Of course if the ring grooves are too wide, and three or four of the patented sections are put in each groove, they will not give the best results and it may be said that neither will any other iron ring or patented device. If the piston rings are stretched in putting them on, they are bent out of shape and will practically never wear in. In that case, there will be more friction and hence more wear than is necessary, but even then, they should not cut the cylinder, and in fact it is stated by piston ring manufacturers that when a cylinder is run dry, it is the piston which will cut the cylinder and not the ring.

The rings can be kept in the cylinders, provided they have never been stretched. If they have not it can readily be noted when the cylinders are off as the rings will be worn evenly all around and where the openings occur at the split, the distance between the ends will be no greater than 3/16 in. If the opening is as much as 5/16-in., 3/4 or more, it is an indication that they have been stretched and should be renewed.

Stalled Motor Hard to Start

Editor THE AUTOMOBILE:—When I stop my engine with the switch I have no trouble in starting it, but when I stall the engine or kill it I have to crank and spin it around a great deal before I can get it started again. What can be the trouble and how can I remedy it?

Westlake, La.

P. W. M.

—The fact that your motor acts in the way you describe should not disturb you, but, on the other hand, is an indication that the carbureter is adjusted excellently for the pur-

pose of securing maximum efficiency. You could easily change the situation and make the motor easy to start after stalling by giving the carbureter an adjustment to provide a richer mixture.

The reason that the motor acts as it does is because when you stop the motor on the switch it has chance to rotate one or two times and thus draw in a fresh charge of gasoline into the combustion chambers. When the motor is stalled or killed it is stopped instantly with the result that the gas remaining in the cylinders is dead and does not possess the power to explode. Should the carbureter be so adjusted that a much richer mixture would be supplied, the influence of the inert gases in the cylinder would be overcome and the motor would fire immediately whether it had been stopped from stalling or for any other reason.

This condition being true shows that the carbureter must be adjusted for as fine a mixture as is possible for good running. It is assumed that the motor acts well while running since you do not state that any other condition exists. If however, you notice that the motor is apt to sputter and flash back when the throttle is opened quickly, it would be well to give a slightly richer adjustment on the carbureter. Unless there is some such indication that the adjustment is not correct it would be better for you to leave the motor as it is and exercise care in driving so that you will never stall the motor. A driver who is accustomed to his car rarely, if ever, stalls the engine as he knows exactly the amount of throttle opening required for each condition and stalling is the result of not giving sufficient throttle opening for the conditions under which the car is being operated.

Alcohol Removes Carbon Deposit

Editor THE AUTOMOBILE:—Is alcohol a good carbon remover. If so, how would you use it and how much would one use?

Lorain, Ohio.

W. G.

—Alcohol is a good carbon remover and for the purpose can be used in its denatured state which is more economical and just as good. The quantity to use for a cylinder at one time would be equivalent to five or six tablespoonfuls. About the best way of applying it is in a sort of squirt gun composed of a rubber bulb in which there is a long, thin nozzle which can be directed against the walls of the combustion chamber and down on the piston head through a spark plug opening. This can be readily made by yourself and should have such a bend in it that it will be easy to insert into the opening for the spark plug and at the same time will be so shaped that the stream of liquid can be directed against any of the likely spots for carbon.

Carbon deposits are apt to accumulate in pockets and recesses of the cylinders and also on the piston heads. Sometimes on motors which have been allowed to go for a long time without having the carbon removed, it is deposited in a conical shaped mass on the head of the piston and very often the tip of the cone becomes incandescent and serves to pre-

ignite the incoming charge, thus giving rise to the so-called carbon knock. Other places for carbon cones to form are in the top of the combustion chamber and in the recesses above the valve ports. The ports themselves which are swept by the incoming and outgoing gases are most often quite free from any but a soft deposit.

Some people in using denatured alcohol mix it half-and-half with kerosene. The two together form a solvent of the resinous material which acts as a binder for the particles of carbon which in themselves are incapable of cohesion. When this binding material is dissolved, the carbon forms into its natural flakes or scales and can be readily removed. Very often after the carbon has been thoroughly loosened it is necessary to blow out the cylinders so as to remove the carbon flakes and prevent them from again solidifying and becoming a hard carbon deposit. It has been the practice of many to clean one cylinder at a time and then run the motor afterwards with the petcock of the clean cylinder open. This blows out the flakes of carbon which have accumulated, due to the action of the solvent upon the resinous binding material and leaves the cylinder clean.

Another method which has been used successfully in introducing either denatured alcohol or kerosene into the cylinders of a motor for removing the carbon is to feed it into the air

intake of the carburetor while the motor is running. The motor will have to be running at quite high speed when this is done, as it will stall as soon as it starts to sputter when the rich kerosene mixture begins to be drawn in.

The time when cleaning a cylinder with alcohol has its best effects is immediately after the motor has come in from a trip and is still warm. At this time a portion of the liquid injected into the cylinders, is vaporized and the vapor of kerosene or denatured alcohol is an effective solvent of the carbon binding material. The best way of carrying through the work would be to lift the hood as soon as the motor comes in from a run and then turn the crank until two of the cylinders are on top center with all valves closed. When this is done these two cylinders should be treated with the liquid which is squirted in through the improvised gun previously described. The motor is then let stand for the night with the alcohol in the combustion chambers of the two cylinders treated. The two remaining cylinders if it is a four, are treated in the same way at the next opportunity.

Some people make a practice of injecting about a teaspoonful of kerosene or denatured alcohol into the priming cup after each trip. When this is done, the necessity for having the carbon removed from the cylinders is postponed for a considerable time as the soft deposit is dissolved each day.

Noise in Gearbox Due to Wear

Editor THE AUTOMOBILE:—Where can I get photographs of all the parts of the Jackson 35 transmission, such as gearbox and shafts? We have a Jackson car which is very noisy in the transmission. Is there any way to get rid of it?

Clyde, Mo.

J. E. B.

—You can secure from the Jackson Automobile Co., Jackson, Mich., an instruction book of model 35 Jackson which contains on page 32 a plate showing the complete layout of the gearset assembly. Opposite this on page 33 there is a complete list of parts together with their prices. As THE AUTOMOBILE has no record of any other place to secure a complete layout of photographs of all these parts it would probably be most desirable for you to secure this in the manner described as at the same time the price list will give you the cost of duplicating any parts necessary.

The fact that the gearset is noisy shows that some parts must be worn, probably the gears, as they are the parts of the gearset which are continuously in service and would consequently stand the most chance of becoming worn and noisy. The way possible to proceed is to take the gearbox down and examine all the parts. In ordering the repair parts it is necessary that you give the serial number of the car, which you will find on the small nameplate on the dash.

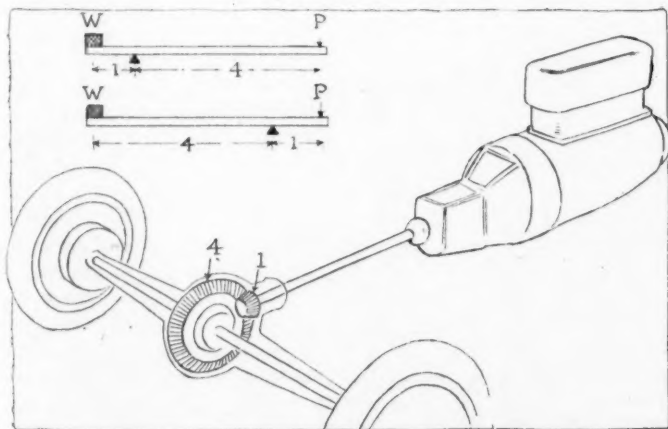


Fig. 1—Diagram showing inverse ratio when using motor for a brake. The small chart shows an analogy with a lever. In the upper example, the pressure on the fulcrum is only $\frac{1}{4}W$, whereas in the lower case where the reduction is 1 to 4, the pressure on the fulcrum is $5W$.

Inverse Ratio Raises Tooth Pressure

Editor THE AUTOMOBILE:—Will you kindly explain in detail, why and how harm will come by using the motor as a brake on hills? From conversations I have heard held by old engineers and mechanics, they fail to see why harm can come to the gear through inverse ratio as you answered H. H. M.'s inquiry of Johnstown, Pa., in the Rostrum Department of THE AUTOMOBILE for May 13.

Kindly explain this fully and if possible, give problems with illustrations.

Ft. Barry, Cal.

A. W. P.

—The practice of using the motor for a brake puts more tooth pressure between the gears than occurs when ordinarily driving the car. If you were to turn by hand a train of gears which instead of having a reduction of 4 to 1 had on the contrary a stepped-up ratio of 1 to 4, you would note the difference in pressure required to turn the gears. It takes exactly the same amount of power applied over the same length of time to bring a car to rest as it does to bring it up to a given speed. That is, the amount of work done is the same. So, it is true to state that if the stop is made in the same distance, the gear wheels are transmitting the same amount of power. Where the factor of increased tooth pressure enters, is, that instead of having a reduction to work

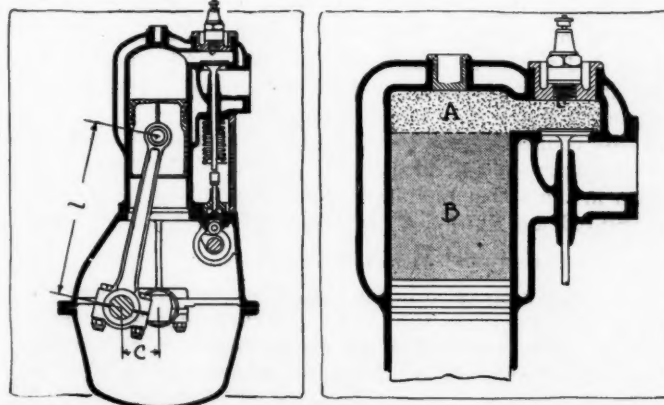


Fig. 2—Diagram showing the determination of the connecting-rod crank ratio and the compression ratio. The left diagram shows the connecting-rod length, 1; and the crank length C. The connecting-rod crank ratio is 1 over C and the diagram to the right A is the compression volume and B the displacement. The compression ratio is $A - B \div A$.

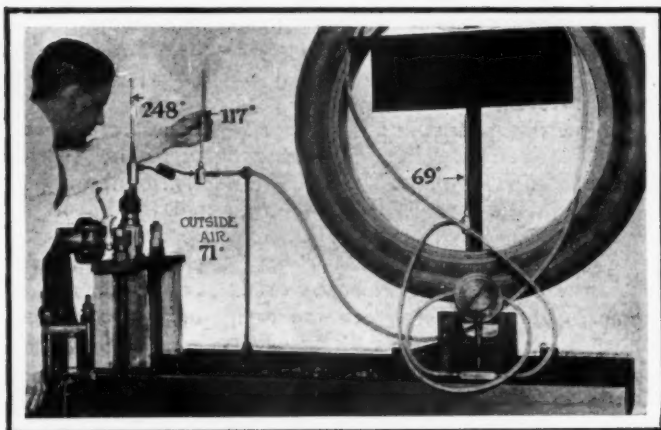


Fig. 3—Illustration showing the arrangement of thermometer used in connection with the test on Stewart tire pump for temperature rise

with of 4 to 1, as in driving a car the ratio becomes 1 to 4 in stopping it. Thus, the proposition becomes similar in many respects to two inclined planes, as shown in the diagram, Fig. 1. If you had to drive a plane which had a slope of 1 to 4 by pressing vertically downwards upon it, it would not move nearly as readily as one which had a slope of from 4 to 1, and, while this analogy is not accurate, it expresses the condition which occurs when the teeth of the small bevel gear sustain the pressure that they do when the drive comes through them in an inverse direction. With a worm and gear this analogy is quite accurate.

Determining Angle of V-Motors

Editor THE AUTOMOBILE:—1—Why do they make eight-cylinder engines of the V type 90 deg. apart and twelve-cylinders 60 deg.?

- 2—How does the Delco motor generator operate?
- 3—What is meant by connecting-rod to crank ratio?
- 4—How do you figure compression ratio?

H. W. C.

Albany, N. Y.

—In the eight-cylinder motor there are four explosions to each revolution; dividing 360 deg., or a complete revolution, by four gives 90 deg., the necessary angle between the cylinder blocks. With a twelve-cylinder motor, there are six explosions to a revolution, and dividing 360 by six, gives 60 deg. as the necessary angle.

2—The motor generator is so wound that when being driven by the motor it acts as a generator and when receiving current from the battery, it acts as a motor. With the battery charged and the switch closed, current flows through the windings of the motor generator, causing the armature to rotate and act as an electric motor. When the gasoline engine drives the generator it gives out current which is utilized for charging the storage battery.

3—By connecting-rod to crank-ratio is meant the length of the connecting-rod divided by the length of the crank. As shown in the accompanying diagram, Fig. 2, if L is the connecting-rod length, and C the length of the crank, the connecting-rod to crank ratio R equals $\frac{L}{C}$.

4—Compression ratio is the ration between the entire volume of the cylinder and the volume of the compression chamber. In other words, it is the piston displacement plus the compression volume, divided by the compression volume.

Three Thermometers on Stewart Test

Editor THE AUTOMOBILE:—I notice in your issue of Aug. 12, on page 303, that you mention a test on a Stewart tire pump which brings out the fact that the air entering the tire at a line pressure of 101 lb. is 69 deg. or 2 deg. cooler than

that of the atmosphere. Will you kindly tell me how the thermometers were mounted to secure the tabulated results in both the power tire pump and the foot pump?

New York City.

S. E. J.

—The tests you mention were made by inflating a 37 by 5 in. tire. In place of the regular air pressure gage on the hose connection, a large dial Bourdon gage was inserted, so as to give the most accurate reading of the pressure. The temperature of the air was taken at three points simultaneously, as shown in Fig. 3. One thermometer was placed in the air passage where the air left the tire pump A. Another thermometer was placed between the cooling coil in the Stewart tire pump and the beginning of the hose connection at B and the third thermometer was placed at the tire valve where the air enters the tire at C.

The arrangements made for holding the tire and measuring the pressure with the foot pump are shown in Fig. 5.

Waterjackets on Speedwell-Mead Motors

Editor THE AUTOMOBILE:—I note in your issue of Aug. 12 on page 285 questions regarding the jacketing of the Meade rotary valve motor in the Speedwell cars. Would you kindly inform me if the jacket spaces as shown by the illustrations on page 285 are in proportion?

New York City.

B. H. S.

—The waterjacket spaces as shown in the diagram are about proportional. The diagram having been made from actual sections of the cylinders. For your benefit, however, Fig. 4 shows engravings made from photographs of cut-away cylinder blocks.

Probable Break in Fine Winding

Editor THE AUTOMOBILE:—I have a 1913 Cadillac, and cannot start the car or run the engine on the battery ignition. I have checked over all connections and tested the wiring, all of which seems to be O. K. I have also changed the battery connections on the induction coil to the coil of the generator, but without success.

The battery button on the switch has the same effect on the relay as the starting button, but a much weaker vibration is had. As I am starting and running on the generator at present, I have no trouble, but would appreciate what suggestions you may have to offer in this regard.

Minneapolis, Minn.

G. P. G.

—From what you say it would seem that the difficulty is only on the battery side and the nature of the trouble is such that although you are unable to run on the battery ignition, the shower spark is still obtained by pressing the button marked B.

It would seem that this difficulty is in the ignition relay, which is equipped with two windings—one a course winding and the other a fine winding. The fine winding is so connected around the contact points of the ignition relay, that whenever the circuit through it is closed, the current flowing through it is sufficient to magnetize the core of the relay and to enable the little armature at the top of the relay to be held down against the pole piece of the magnet until the circuit is opened by the breaker and distributor. The coarse windings above mentioned on this relay are connected in series with the dry cells and the contact point of the relay and the spark is obtained by breaking the circuit through the coarse winding.

When, therefore, the circuit through the fine winding is closed, only a single spark is obtained at the spark plug for the reason that when this circuit is closed at the breaker points in this distributor, the armature on the little relay is drawn down, opening the points on the relay which are in series with the coarse winding, thus breaking the circuit through the coarse winding and giving a single spark at the plugs.

Inasmuch, however, as the fine winding is also closed, the little armature is unable to go back to its original position

and close the contact points. It is therefore compelled to remain down until the circuit is opened through the distributor. When, however, the starting button on the switch is depressed, the circuit through the fine winding on this little relay is opened. Under these conditions, therefore, when the circuit through the coarse winding is closed through the breaker points in the distributor, the little armature at the top of the relay is drawn down in the usual way, breaking the circuit through the coarse winding at the relay contacts. The minute these contacts at the relay are broken the magnetism in the coil dies away; the relay returns to its original position, the contacts are again closed; the pole piece again magnetized and the relay again drawn down, breaking the circuit again through the coarse winding at the relay point. As the fine winding is open there is no means of holding the little armature down firmly against the pole piece. Hence it vibrates very rapidly, making and breaking the circuit through the coarse winding at a very high rate, thus giving a shower of sparks at the spark plug.

From the information you give, it would seem that there is either an opening in the fine winding or that the relay is improperly adjusted. There are two windings upon the magnet, one being comparatively coarse and the other fine, as described. To quote from the Cadillac instruction book covering this point, these wires are so connected that the current ceases to flow through the coarse wire when the contact is broken. The fine wire connected around the contact is so arranged as to hold the armature after the current is broken through the coarse wire coil. If this second coil were not affected the contacts would vibrate giving a shower of sparks at the plug instead of a single spark. This is what is done in starting and it is done at this time only because it would be wasteful of current to continue it under running conditions.

If the armature vibrates rapidly when the *B* button on the ignition switch is depressed, the holding coil circuit is open. Test the circuit and in emergency connect the two terminals closest together on the relay with a wire. This will stop trouble if the break is outside the relay. If the armature vibrates freely, it indicates either weak batteries or dirt between either the relay or timer contact.

Again quoting from the instruction book covering this point, the following suggestions are made:

"Loose connections, grounded wire and weak batteries may cause improper working of the relay through no fault of the device itself. The only point of adjustment in the relay is at the pole piece. This regulates the distance between the armature and the magnet pole and a gap between the contacts.

Adjustment is made by turning the notched head clockwise as one looks down upon it to increase the gap between

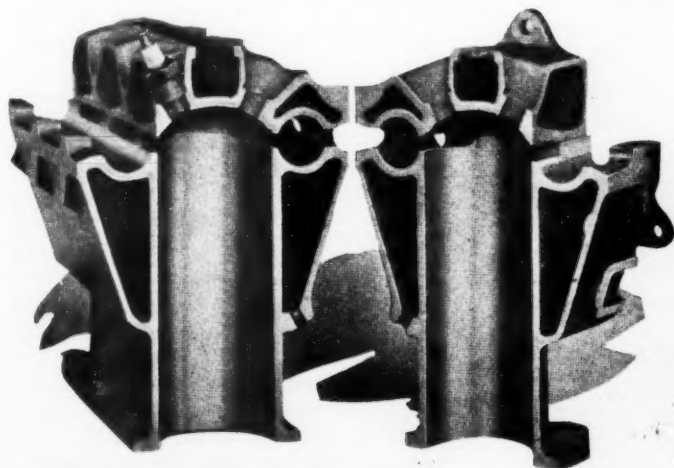


Fig. 4—Arrangement of cored passages on the Speedwell Meade motors which were described in the Rostrum Issue of THE AUTOMOBILE for Aug. 12.

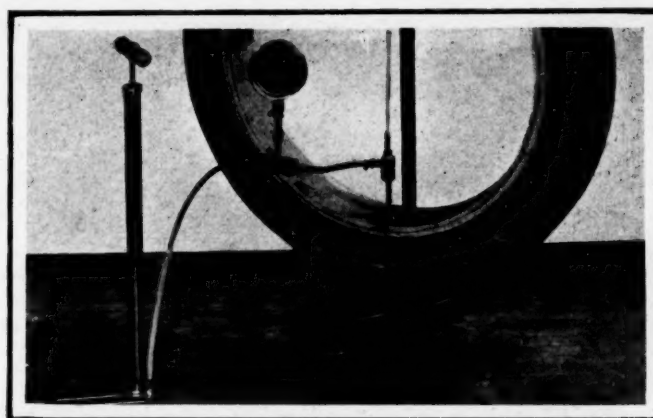


Fig. 5.—Position of thermometer and pressure gage used in connection with tests showing temperature rise with ordinary foot tire pump

contacts and vice versa. Normally this adjustment should be such that the distance between contacts when armature is pressed down is about equal to the thickness of a sheet of paper. A simple way in which this adjustment may be made is to turn the notched head of the adjusting screw in a counterclockwise direction until the motor stops firing. Then turn it four or five notches in the opposite direction. Under no condition should the adjusting screw be turned very far in either direction. If particles of dirt get between the armature and pole piece at the point they may be removed by slipping a piece of smooth paper between the parts mentioned, pressing down slightly upon the armature and pulling out the paper."

It is therefore suggested that you make sure that this fine winding in the relay is not open; that the relay itself is correctly adjusted; that all the dirt is removed; that the contact points are in good condition, that all connections are tight and that the dry cells themselves have not become too weak and need replacing. The wiring diagrams of this car are given fully in the Cadillac 1913 instruction book which was provided with the car.

Simplex Won Three Successive Races

Editor THE AUTOMOBILE:—Did the Simplex win three 24-hr. road races in succession?

Why is the Simplex not being entered in the 500-mile races now prevailing?

Did the Simplex ever make 100 m.p.h. according to record?
R. L. R.

New Haven, Conn.

—The Simplex 50-hp. stock chassis won the 24-hr. races at Brighton Beach in 1909, 1910 and 1911. These were three races in succession.

2—The Simplex is not being entered in 500-mile races because the Simplex company is not a manufacturer of special racing cars and the 50-hp. motor made by this concern has a cubic inch displacement of 597. As the limit for cubic inch displacement in these races is now 300 it is impossible to enter the cars in the races.

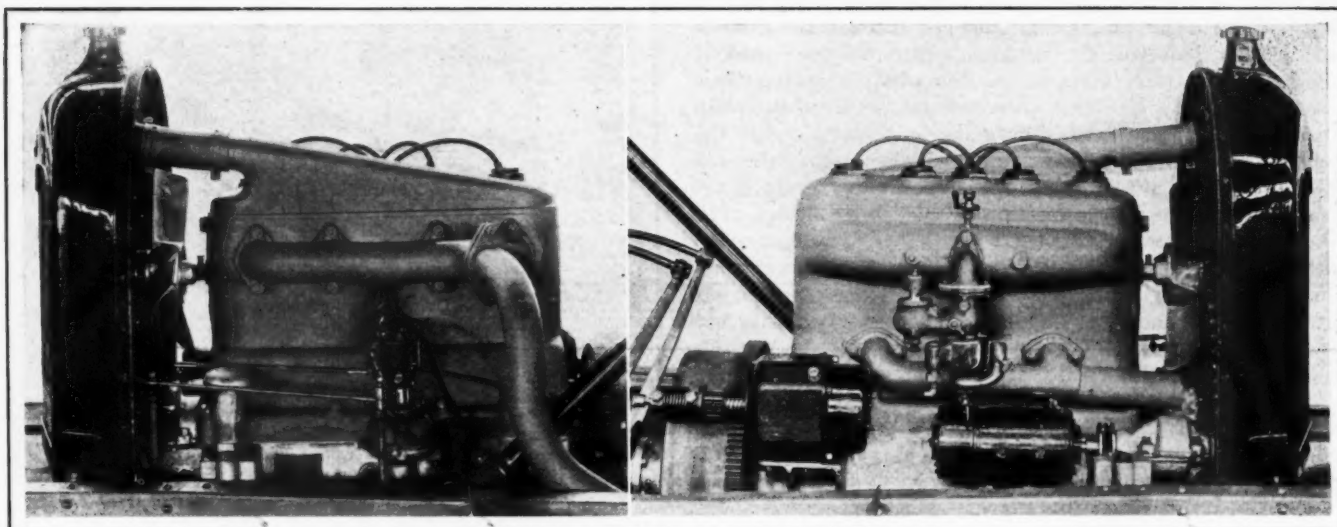
3—The Simplex car has made 100 m.p.h. according to several records.

Compression Pressure Is 70 Pounds

Editor THE AUTOMOBILE:—I have a 1912 four-cylinder, Isotta-Fraschini, the bore being $3\frac{3}{8}$ -in. and the stroke $5\frac{1}{2}$ -in. It is the O. M. type of car No. 1616. What compression should the motor have? Who has the agency for this car?

Wilmerding, Pa.
D. G.

—The compression pressure of this motor should be about 70 lb. per sq. in. The agency for this car is the Isotta-Fraschini Motor Co., New York City.



Both sides of the Moline-Knight 40 motor showing how block casting and cored passages have resulted in clean exterior

Moline-Knight Featured By Simplicity

Model 40 at \$1,475 Has Cored Manifolds, Block Casting, Central Spark Plugs and Many New Chassis Features Including Novel Type of Rear Suspension

PRACTICALLY all the features which were successfully used in the Moline-Knight 50 motor have been retained in the new one, which is listed under the name of model 40, at \$1,475, but in addition a number of unusual features which have all tended toward simplified design have been introduced. The intake manifold is integral with the cylinder block, the object being to have it surrounded by a complete waterjacket space to insure the vaporization of the heavy gasoline now on the market. The cylinder heads are covered by a removable plate over the cylinders providing a greater amount of waterjacketing space over the top of the cylinders than is generally employed. The motor has aluminum alloy pistons, the electric wiring is brought up through the block casting from the distributor to the spark plugs and in addition incorporates a valuable detail improvement in the drive of the fan and the manner in which it is adjusted.

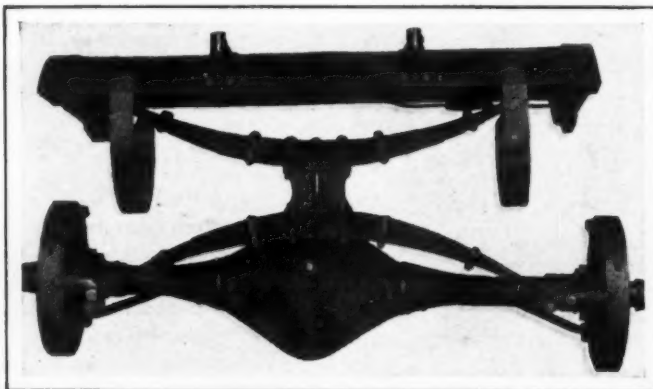
The results obtained by the new motor are shown in the brake horsepower curve herewith. It will be noted that the peak of the curve is at approximately 2200 r.p.m. and the curve is practically a straight line from 700 to 1350 r.p.m., at which point 34 hp. is developed. The port areas of the motor which have helped toward securing the power curve shown are 1.42 sq. in. for the intake and 1.62 in. for the exhaust. The valve timing shows the characteristics of a high-speed motor, the exhaust opening 50 deg. before lower center and closing 11 deg. past upper center. The intake opens at 18 deg. past upper center and closes at 50 deg. past lower center. The throw of the eccentric for the sleeve is 1 in.

Referring to the sectional view of the motor, it will be noted that the head of the cylinder is a cone-shaped cap carrying the spark plug in its center. This sets into the cylinder to a depth of several inches. An example of the care with which the water system has been designed on this car is shown here, the space between the center and sides of the cap being in the water circuit so that the upper ends of the two reciprocating sleeves have water circulation on both sides of them at A and B. The cylinder cover plate forms the upper water manifold through which the water passes to the radiator. The lower connection from the radiator to the motor has two branches, one leading to the forward and the other to the rear end of the cylinder block, thus insuring uniform distribution.

Briefly, the new car has a $3\frac{1}{2}$ by 5 four-cylinder block Knight motor, two-unit electric lighting and start system, thermo-syphon cooling, 118-inch wheelbase, cone clutch, three-speed gearbox with center control, spiral bevel drive and 34 by 4-inch tires.

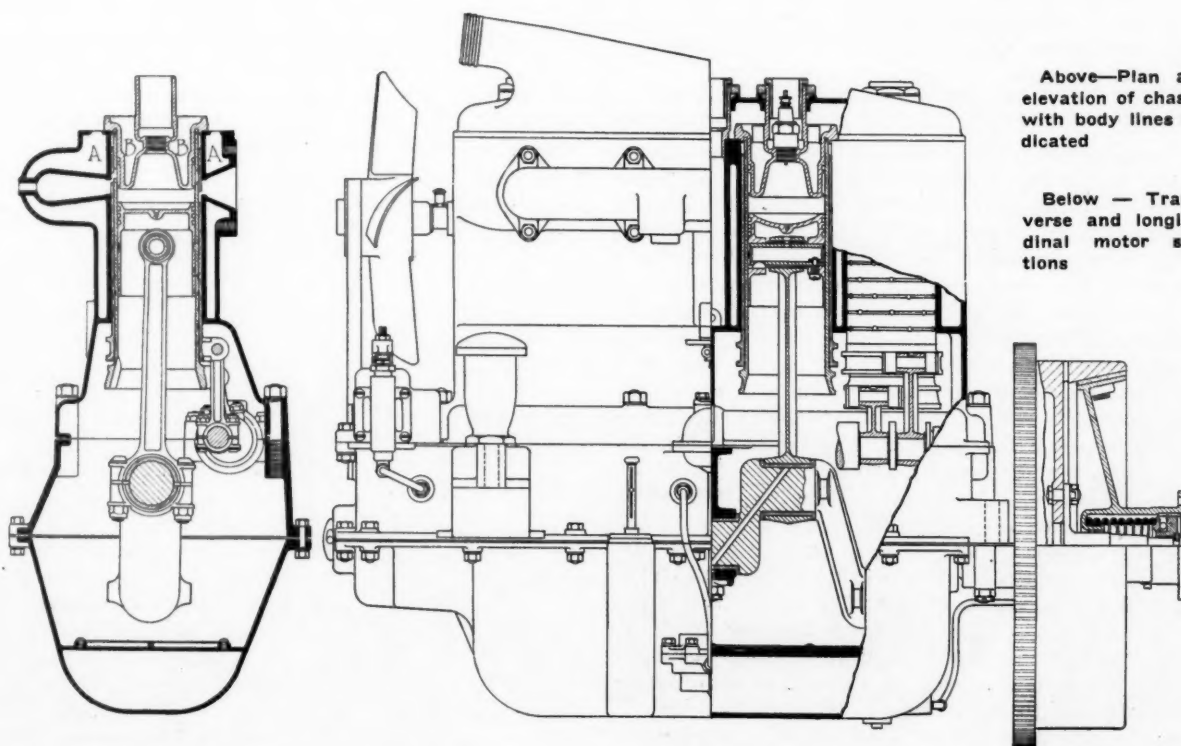
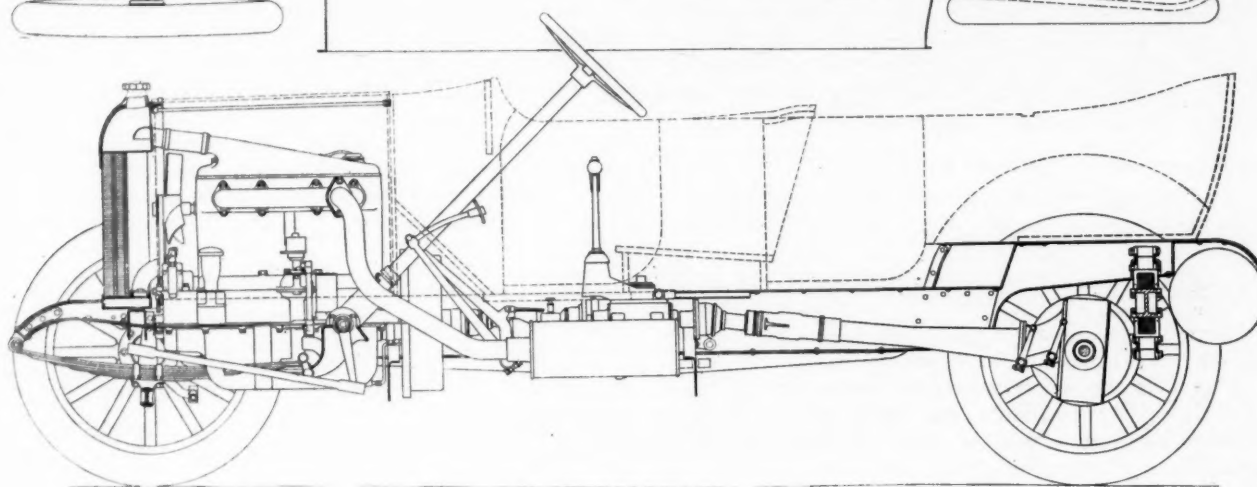
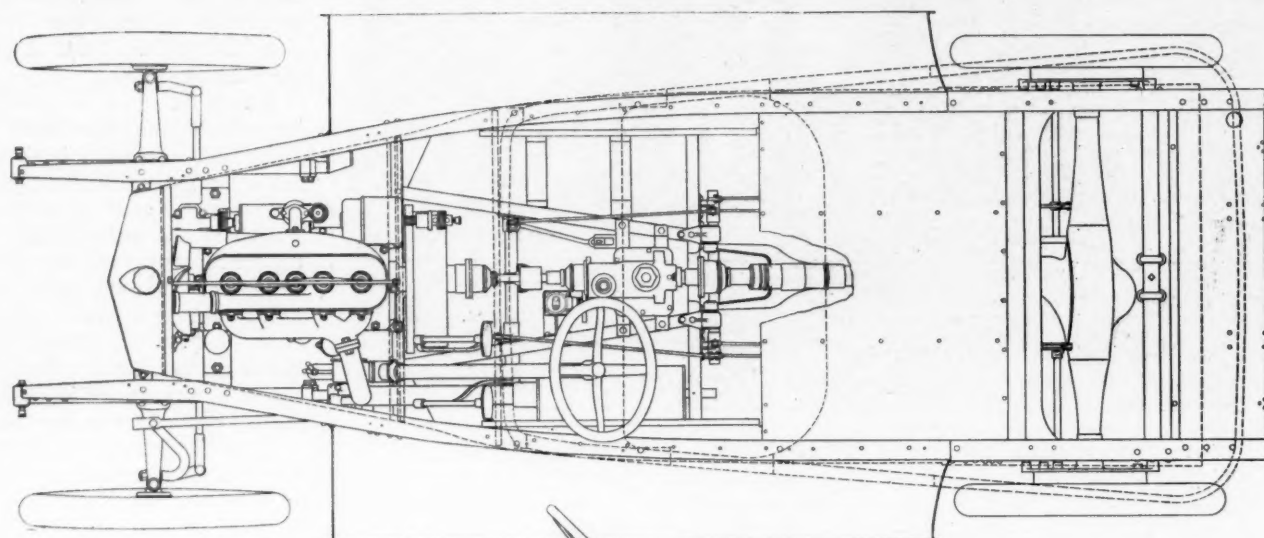
A change is in the use of an I-beam connecting-rod in place of the tubular section used on the 50. The oiling system has been redesigned in some details and in connection with this the vertical shaft which drives the oil pump carries, at its upper extremity, the distributor for the Connecticut ignition system.

Other than in the use of aluminum pistons which were used in the 50, nothing radical has been done in the way of material. The cylinders are a dense gray casting iron and the cylinder heads also



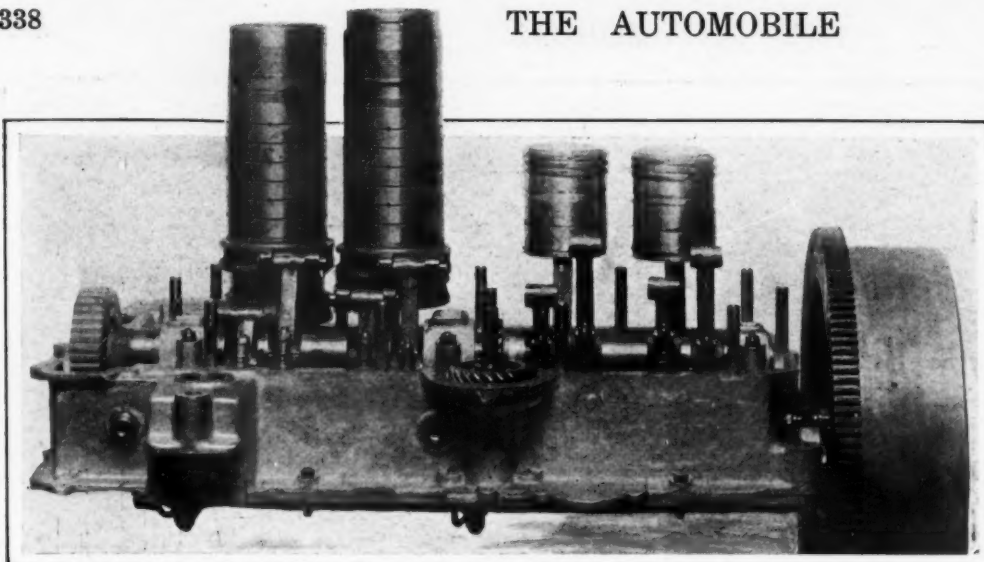
New rear suspension adopted by the Moline company

Constructional Views of the Moline-Knight 40



Above—Plan and elevation of chassis with body lines indicated

Below — Transverse and longitudinal motor sections



Motor cylinder block removed showing sleeves and crankshaft units

a gray iron mixture. The sleeves are also cast iron and machined within limits to render the sleeves interchangeable. The wristpins are tubular and case-hardened, transmitting the drive to the drop-forged double-heat-treated connecting rods. The crankshafts are also drop-forged of 0.50 carbon steel and go through two heat treatments.

Eccentric Shaft Drive by Silent Chain

The eccentric shaft is driven from the crankshaft by a silent chain, the centers on this drive being kept very short. In order to keep a proper tension on the chain and proper valve timing the sprocket on the eccentric shaft is provided with a Vernier adjustment. The material used in the eccentric shaft is open-hearth 0.50 carbon steel. The running compression of the motor is 75 lb. per sq. in.

In dimensions the motor shows no departures from ordinary practice, the connecting-rods being 10 $\frac{1}{4}$ in. in length with 2 $\frac{1}{2}$ -in. bearings at the big end. The diameter of the crankshaft is 2 in. and the piston length is 1.21 times the bore or 4 $\frac{1}{4}$ in. The bearings are bronze-backed nickel-babbitt. The clearance allowed between the sleeves and between the sleeves and cylinder varies between 0.001 and 0.0015 in. There are three piston rings 3/16 in. in width and they are all of the eccentric type.

Pressure Lubrication System

The pressure system of lubrication is used. A gear pump driven from the eccentric by means of a spiral gear takes oil from the oil sump in the lower half of the crankcase and pumps it into a supply pipe running the entire length of the case. From this point leads are taken to each of the three main bearings. Oil is carried to the crankpin bearings through leads drilled in the crankshaft arms. These holes are drilled from the crankpins to the main bearings and register at each revolution with the oil leads to the main bearings. The oil pressure is controlled by means of an oil by-pass valve connected directly to the throttle thus opening or closing the throttle which automatically increases or decreases the oil pressure to the bearings. The oil pressure varies from idling to full open throttle from 5 to 40 lb. The sleeves and pistons are oiled from the spray of oil from the connecting-rod and the oil by-pass is so placed that the surplus oil not needed for the lubrication of the motor flows to the eccentric shaft and generator chains. The oil draining from all parts is filtered through a fine gauze over the oil sump, removing all particles of carbon and residue coming from the motor, or any foreign substances that might be in the oil before it is returned to the oil sump.

The electric system of the car consists of a Connecticut ignition outfit with a Wagner generator and an Auto-Lite

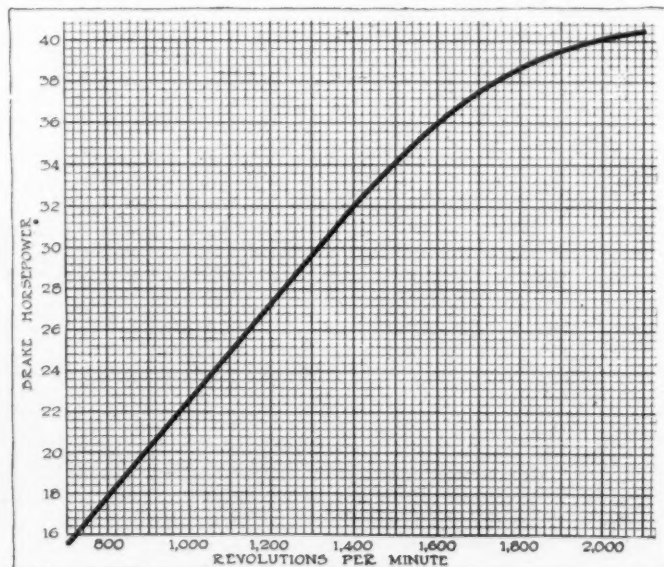
starting motor. The gasoline feed is by the vacuum system with the gasoline tank on the rear of the chassis where it is accessible behind the body. The carburetor used is the Schebler model R.

A new feature is the method by which the fan belt is tightened. The fan is driven from the generator shaft by a split sheave and if the fan belt becomes loose, it can be tightened by tightening a nut ahead of the sheave. This brings the two halves of the sheave closer together and tightens the belt. The nut ahead of the sheave is secured in any given position by a star lock washer and when the adjustment is made can be secured by attaching this.

The clutch used in connection with the new car is a conventional leather-faced cone design with cork inserts. The clutch is aluminum and is connected with the gearbox by two universal joints. The gearbox is located amidships. The gearset is a compact design mounted on annular ball bearings and plain bearings with the shifter lever centered directly on the cover plate. The gears are 3.5 per cent nickel steel and the distance between the bearings on the main shaft of the gearset is 5 $\frac{1}{2}$ in. The face width of the gears is 0.625 in.

Inclosed Propeller Shaft

The drive is taken through a high-carbon steel shaft 1.375 in. in diameter to the spiral-bevel rear axle which is housed within a pressed steel cover. A seamless tube is used to house the propeller shaft and is bolted to the differential carrier. The propeller housing is kept in alignment by strut rods and the axle housing is practically relieved of strains as with the new spring suspension the support is brought closer to the wheels than is generally the case. The driving spiral bevel gears are of nickel steel and the axle shafts are also nickel steel 1 $\frac{1}{4}$ in. in diameter. The driving pinion is carried by a double row bearing behind the pinion and a single row bearing ahead of the pinion, thus assuring perfect meshing of the spiral bevel gears. All the other bearings in the axle have Hyatt rollers. The assembly of this part of the



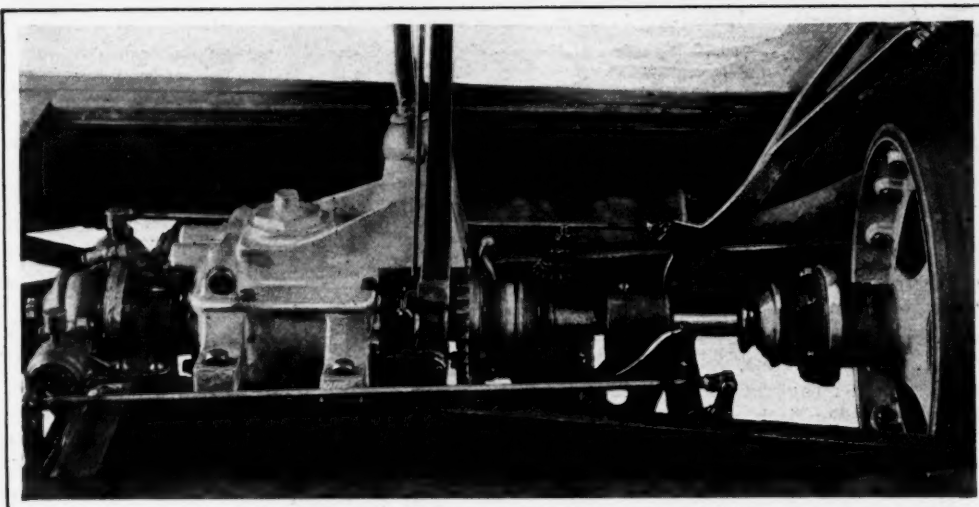
Horsepower curve of the Moline-Knight 40 motor

car is very simple as the axle shaft can be removed on removing a collar and then the pinion and differential assembly can be disassembled.

Double Cross Spring

Perhaps the most radical change about the entire car is in the spring suspension. As shown by the accompanying illustration, the spring is comprised of two independent cross members, which is entirely unconventional. The assembly is made up of two semi-elliptic springs, 42 in. in length, bolted together in the center by means of a special fitting and clips. This makes a double semi-elliptic cross-member running parallel with the rear axle. One end of the upper spring shackles to the frame while the other is attached to the frame but is stationary. The lower spring is fastened in the same manner except that the shackles are on the brake drum. It is stated that one of the results of this spring suspension is to avoid side sway. It is also claimed to be lighter than the conventional method of suspension.

Another development is in the frame construction which has side members 7 in. in depth. The rear part of the frame is stiffened by a pressed steel brace which is formed to go over the gasoline tank and besides being a stiffening member is also a protection to the tank. Another member which absorbs wracking strains is the tonneau floor which is composed of a sheet of pressed steel. Additional strength is gained by the subframe on which the gearset is suspended. The running board suspension is not riveted to the frame in the usual



Clutch, gearset and universal driving members in the Moline-Knight model 40

manner by brackets, but instead, the running board itself is hot-riveted directly to the frame. The two ends of the running board curve upward and bolt firmly to the fenders giving a complete frame assembly of great strength, due to its unit construction.

Wire Wheels \$80 Extra

Two sets of brakes are on the rear wheels. They have 14-in. drums with face widths of 2½ in. The wheel equipment consists of four wood wheels and an extra rim with wire wheels optional for \$80 per set. The fenders are crowned and the finish consists of twenty coats of paint and varnish. The body is a sectional design made in three units, consisting of the cowl, front seats and tonneau. This is done to guard against squeaking and also if desired, the tonneau can be removed and an open body substituted for transporting merchandise.

French Car Owners Must Pay Taxes

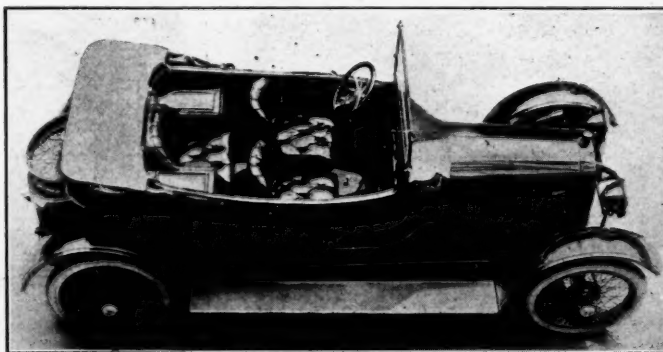
PARIS, Aug. 7.—French automobile owners are eligible for the payment of all motor taxes, notwithstanding the war. In the whole of France there are restrictions on motor-ing; in many districts it is forbidden to use a car; in the parts of France farthest removed from the battle zone it is necessary to have a pass renewable fortnightly. Hundreds of cars are lying idle owing to the absence of their owners at the war. In all these cases taxes have to be paid. The claim has been put forward that where permission to use a car cannot be granted, or where the absence of the owner has made the use of the car impossible, taxes should not be exacted. This claim, however, is not admitted. Ownership of the car entails taxation. As the average automobile tax in France is \$30 to \$35, the matter is of some importance to car owners.

Same Situation in Switzerland

The same situation has arisen in Switzerland, where for the last 5 months of 1914 private automobile traffic was forbidden. In the canton of Geneva five-twelfths of the taxes have been remitted, thus owners do not pay for the period during which they were not allowed to use their cars. In other cantons the taxes are maintained for various reasons. In several cases the tax is so low, being about \$4 a year, that the authorities consider it is not necessary to make a reduction. In other cases it is stated that the circumstances are

exceptional and automobile owners must take their share of supporting the State. When automobiles are requisitioned temporarily for military service they are not taxed during that period. In France, if automobiles are taken into the army for a limited period and then returned to their original owners, they are taxed as usual. Thus, no matter what his military status, the car owner must pay for the privilege.

A Three-Passenger Lexington-Howard

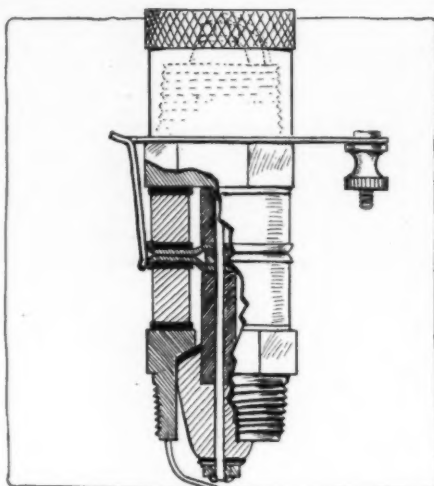


Novel body recently brought out by the Lexington-Howard Co., Connorsville, Ind.

ACCESSORIES

Double-End Spark Plug

BOTH ends of the Double End spark plug are alike in construction so that either may be inserted in the cylinder. When in use, the upper end fires as well as that in the cylinder so that it acts as an indicator of the condition of the spark for the cylinder. It is practically two plugs assembled into one, as illustrated. The insulator is sheet mica, and when the points at one end are worn out, the plug may be reversed after the worn part is cut out of the circuit. The plugs are listed at \$1.50 each.—Twin-Spark Sales Co., New York City.



Either end of the Double-End spark plug may be used

Limousine Jiffy Jack

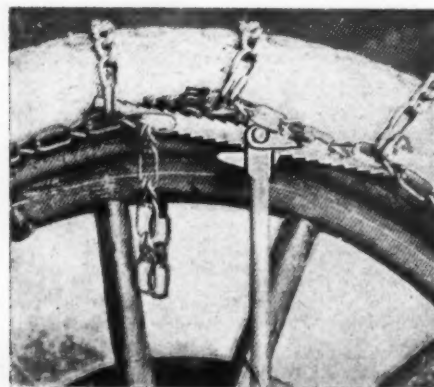
The latest model Jiffy jack is the limousine type illustrated herewith which is claimed to have a lifting capacity of 5000 lb. It is of the rack type, the rack being made of laminated steel, the pawls are forged with machined tips, heat-treated; pawl controlling parts are of case-hardened machine steel, and the pawl spring is of rust-proofed steel. When the load is removed the rack automatically drops. The jack weighs 9 lb. Furnished with wood handle it sells for \$3.50.—The Jiffy Jack Co., Cleveland, Ohio.



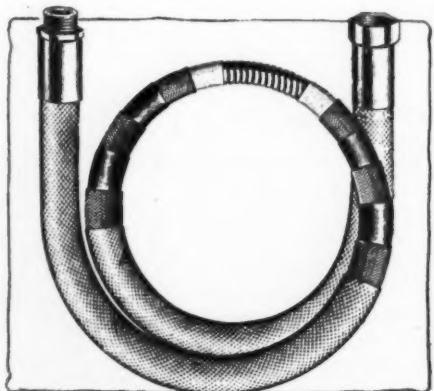
Limousine model Jiffy Jack with safety drop

McGuire Tire Chain Tool

To assist in applying tire chains easily and securely, the McGuire tool has been brought out, allowing the chain ends to be brought together easily. The tool uses a dog and a ratchet, the dog holding the ratchet in any desired position. Hooks on the ratchet grip the chain ends and by pushing down the handle the ends are brought together as far as desired, the ratchet automatically



The McGuire tool brings the ends of the tire chain together easily



Everlasting gasoline hose is built of eight layers, no rubber is used

locking itself in position, holding the chain ready for closing of the clamps. The tool is 9 in. long, weighs 14 oz. and can be disassembled and put in the chain bag. Price, \$1.—E. P. McGuire, Van Houten, N. M.

Chicago Flexible Tubing

The Everlasting gasoline hose is built up of eight layers, the inner lining being of flexible steel under a layer of fiber, one of braid, one of special gasoline-resisting composition, these two layers then being repeated and then the waterproof outer jacket which is woven on. No rubber is used. Other products of the maker of Everlasting hose are hot air hose for carburetor connections, oil, air and steam tubing and acetylene tubing and connectors.—Chicago Tubing & Braiding Co., Chicago, Ill.

Apco Anti-Rattlers

A combination hood anti-rattler and holder is one of the many Auto Parts products. This is a helical spring which has several special clamps attached. The spring is placed transversely under the hood and the clamps are slipped over the lower edges of the hood. The sides of the hood may then be raised to any extent desired without rattling. This arrangement is of assistance in keeping the motor cool in very hot weather as a circulation of air may be obtained without the disagreeable clatter of the hood rattle. The anti-rattler is finished in black enamel and sells for 10 cents.

Another Auto Parts product is the new door anti-rattler for Fords which is a simple construction of spring steel, which is attached to the body part of the hinge by one of the original wood screws. It is made for the 1913, 1914 and 1915 Ford models. It is finished in black enamel and sells for 20 cents. It is supplied to the trade on a display stand, there being twenty anti-rattlers to the stand.

The new Apco valve grinding tool has a universal joint which compensates for any variation from vertical when in use. The weight of the device is sufficient to provide the necessary pressure. It sells for 20 cents.

An improved cutout pedal is also offered which is attached by locking nuts and washers instead of screws.—Auto Parts Co., Providence, R. I.

Strickler Grease Gun

A grease gun designed to force grease through obstructed places with heavy pressure is the Strickler, which is of heavy construction throughout, the hexagonal steel barrel being threaded for a plunger, also of steel, with an air chamber, as the accompanying illustration shows. The outer end of the plunger has a hexagon head to which a wrench can be applied and a hole for a bar. The lower

end of the barrel is threaded for nozzles which, in turn, are threaded to go into grease cup tapped holes; nozzles are made in all standard sizes, with both internal and external threads.

In using the gun the nozzle is screwed into the place of the grease cup and the plunger screwed down by hand until the grease is forced through the bearing. If grease cannot be forced through in this way pressure is applied with a bar or wrench and the bearing moved at the same time to facilitate the passage of grease. The maker states that a pressure of 900 lb. can be attained. Price, \$1.50.—Powers Sales Co., Chicago, Ill.

Lawall Vulcanizer

The Lawall vulcanizer is of the tool-box type and can be used for both tube and casing work. An important feature of the device, which is of the type in which gasoline in a reservoir is ignited and allowed to burn out, is that the fuel container has a deep and a shallow section; the fuel in the shallow section burns for about 5 min., this being the time required to bring the vulcanizer to the proper heat; by that time the fuel runs dry in the shallow part and the deeper section, nearer the mouth, burns alone, being just sufficient to maintain the proper temperature for 15 min. Part of the outfit is a swivel clamp by means of which the vulcanizer can be held against the tire for casing work or on a tube for patching. The complete outfit consists of the vulcanizer proper, made of aluminum, a swivel clamp with small bench clamp, tube plate, repair materials and scissors. Everything goes into a neat canvas roll. Price, \$3.50.—L. C. Lawall, Richmond, Ind.

Foxy Gasoline Gage

The Foxy gasoline gage for Ford cars has been designed to meet the requirements for a device which can be easily installed. It consists of a cylindrical brass float chamber on top of which is mounted a glass gage tube, the pointer in which is a little ball mounted on the vertical rod extending upward from the float. Figures form the indicator on the gage tube.

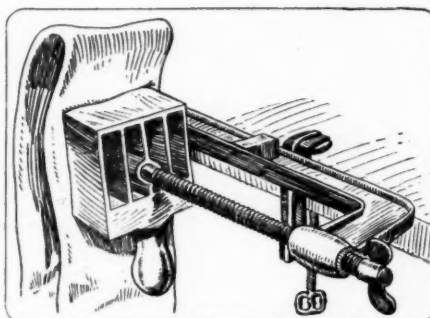
To install the device, the gage is secured to the dashboard and then connected to the gasoline feed pipe by means of a T fitting, a notch being cut in the footboard for the gage to fit. The device sells for \$3.50.—Fox Gauge & Specialty Co., Brooklyn, N. Y.

Paco Racing Bodies

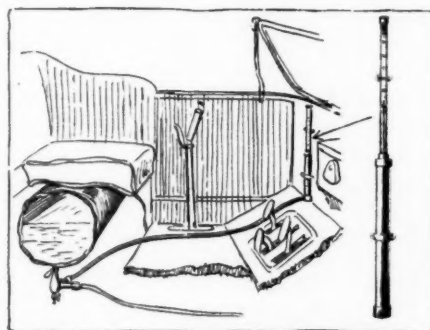
For owners of Ford and other small chassis who wish to make their cars into speed creations the Paco racing type bodies have been designed. These are in two streamline styles, one for track work and the other for ordinary use, the former having its seats staggered and



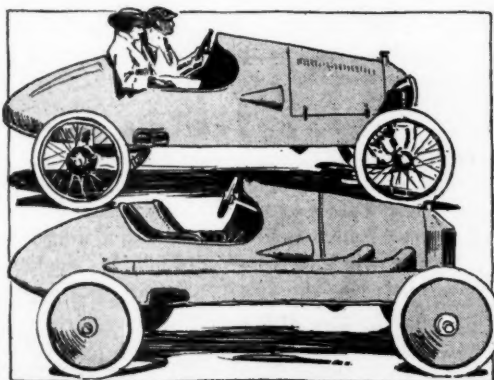
The Strickler grease gun forces the lubricant through obstructed places with heavy pressure



The Lawall tool-box-type vulcanizer can be used for both tube and casing work



The Foxy gasoline gage is mounted on the Ford dash and connected directly to the tank



Left—Paco racing type bodies for Fords and other small chassis, the upper being for ordinary work while the lower is for track racing. Upper right—Nurinkle tire gage. Lower right—Victor bronze-back bearing

the cowl brought up close to the steering wheel with the exhaust pipes coming through the hood to meet in a single large manifold. The rear is streamlined and the steering column raked while the pedals are bent to conform with the low driving seat. Equipment includes a new dash, hood air pump and pressure feed system with complete directions for installing. The material is 20-gage iron, with all seams riveted.

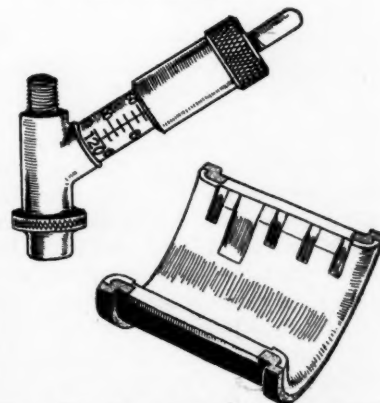
The other body is similar in general appearance but the exhaust pipes are not brought through the hood. Equipment is the same. The bullet-shaped rear contains a 15-gal. gasoline tank and sufficient space to carry luggage. Crated for shipment, either body weighs about 350 lb. Price of either style is \$165 complete.—Peoria Accessory Co., Peoria, Ill.

Nurinkle Tire Gage

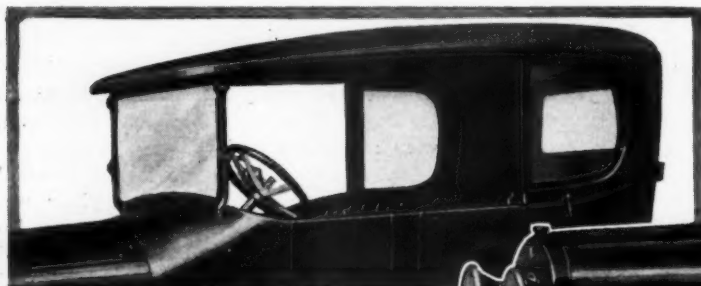
Under the name of the Nurinkle, an automatic tire gage has been put on the market. With this gage in the air line and adjusted to a certain pressure, the moment this pressure is attained the excess air is expelled through a check valve. At the same time the gage registers the pressure on a graduated cylinder which is part of the device, as illustrated herewith. The small knurled nut on the top of the device serves to regulate the pressure. Price \$1.25.—Nurinkle Co., Indianapolis, Ind.

Victor Bronze-Back Bearing

Victor is the name of a bronze-back die-cast bearing in which the soft metal is made almost integral with the bronze by an ingenious locking arrangement. The bronze shell is machined to size, after which the bearing metal is die cast in the shell under pressure and is soldered and locked as indicated in the accompanying illustration by the dovetail joints formed between the bronze and bearing metal. These joints are said to hold the bearing metal to the bronze at the four sides so strongly that separation is practically impossible.—Modern Die & Tool Co., Indianapolis, Ind.

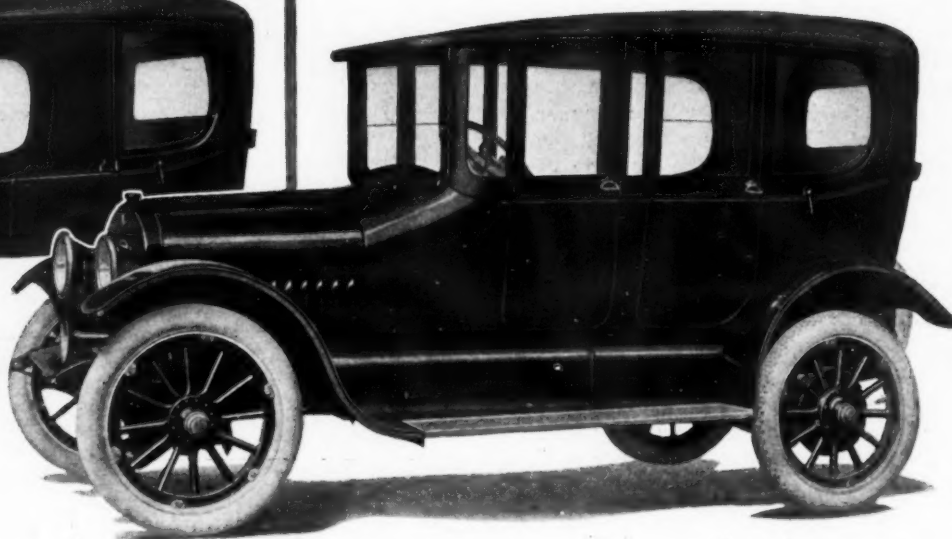


Rex Convertible Top—Sedan or Open Car



Above—Rex convertible top with side windows removed, giving a practically open car. The rear seat is protected from drafts by the rear quarter

Right—Rex convertible top arranged to make a sedan, there being no part which is flimsy or likely to rattle. It is said that two men can replace the ordinary type of top by the Rex in less than an hour



THE large number of convertible bodies which have been introduced during the past 12 months shows that there is a strong tendency to replace the ordinary top by something which gives a better combination of the advantages of closed or open bodywork. One of the latest attempts to solve the problem is the Rex sedan top made by the Rex Buggy Co., Connersville, Ind., and this has been taken up by the King Motor Car Co., Detroit, Mich.

To accommodate this top the body is made to an ordinary open design, and top irons are attached at the usual places, but instead of using the ordinary iron a socket is fixed securely to the main body frame, showing a threaded hole starting flush with the face of the panel when the body is completed. There are four of these sockets and the irons for carrying the ordinary folding top simply screw into the sockets.

To fix the Rex top the ordinary irons are unscrewed and four others put in their place; these providing four vertical studs on which the Rex top is set and held down by nuts. This gives a rigid attachment for the rear part, and the front end is secured to the upper extremities of the windshield irons.

The main frame of the Rex is hard wood, well strengthened at the joints and comprises the leather and Pantasote roof with the back piece and a post located just aft of the tonneau doors on each side. In this condition the body is just as much an open one as with an ordinary top and no side curtains.

The rearmost windows are held in frames which can easily be put in place and fixed by screws, this protecting the tonneau seat from side drafts. To attach the door windows a few screws are run vertically into sockets on the top edges of the doors and into the body side piece between the doors, the parts to which the windows hinge being also attached to the roof frame. An ingenious idea is the use of thin pressed metal troughs which connect the bottom edge of each window piece with the top edge of each door. As the windows and doors swing on different hinges a gap opens between the two as the door is opened and there is risk of pinching a finger between the two when closing the door again. The metal trough closes this crack and removes the danger while also assisting to keep out driving rain.

All around the top is a narrow leather flap which covers the junction and closes any crack, while the weight rests on felt pads which prevent injury to the paint. Inside the finish

is in cloth or Bedford cord so the appearance is handsome. To give ventilation the tonneau windows are divided and the top half can be lowered instantly. There is no part which is flimsy or rattlesome.

The King company has arranged with the makers of the top to supply King dealers at a special price, and it is understood that the top is attachable to any model D touring car. The weight is stated to be about 175 lb., or about 100 lb. more than a folding top.

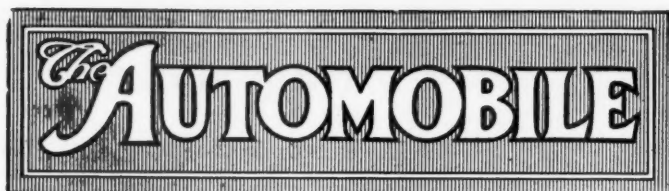
261,860 Cars Have Electric Systems— Other Statistics

EAST PITTSBURGH, PA., Aug. 14—Some interesting statistics have been compiled by G. Brewer Griffin, manager of the automobile equipment department of the Westinghouse Electric & Mfg. Co. in regard to the car and lighting and starting equipment production.

Mr. Griffin states that 261,860 cars have been equipped with electric lighting and starting, while the total production in this country during the last calendar year was 611,695, valued at \$380,000,000, at an average dealers' value of \$621.50 per car. Of this production 350,000 are counted as Fords, worth \$136,500,000. The total value of electrical equipment is given at \$10,354,570.

Other statistics cited by Mr. Griffin are estimates of materials used in 1915 cars. These are: 670,000 tons of fabricated steel; 4020 tons aluminum and alloy; 2141 tons manufactured brass; 1068 tons curled hair; 2050 tons moss; 67,232 hides, or one-third hide per car; 3,280,000 sq. yd. imitation leather, or 8 yd. per car; upholstery fittings such as cord, tape, etc., worth \$917,542; 6,560,000 yd. burlap, etc.; 11,405,250 yd. top materials and linings worth about \$2,447,780; 7950 tons manufactured cotton used in tires on new cars; 300,000 lb. sheet celluloid; 9338 tons rubber and compound; 2,446,780 pairs of hinges; and the same number of door catch fittings; 489,356 sq. yd. carpet for tonneau; 642,908 sq. yd. linoleum for running and toe boards; 8,450,850 board ft. manufactured hickory and other woods for floors, wheels, bodies, etc.

In the starting, lighting and ignition industry alone Mr. Griffin states there are between 9000 and 10,000 people employed.



PUBLISHED WEEKLY
Copyright 1915 by The Class Journal Co.

Vol. XXXIII

Thursday, August 19, 1915

No. 8

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, Secretary
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

EDITORIAL

David Beecroft, Directing Editor
Donald McLeod Lay A. Ludlow Clayden
J. Edward Schipper Sydney Orberry
L. V. Spencer, Special Representative, Detroit

BRANCH OFFICES

Chicago—910 South Michigan Ave., Phone Harrison 7707
Detroit—95 Fort Street, West, Phone Main 1351
Cleveland—516-517 Swetland Bldg., Phone Prospect 167

Cable Address ----- Autoland, New York
Long Distance Telephone ----- 2046 Bryant, New York

SUBSCRIPTION RATES

United States and Mexico ----- One Year, \$3.00
Canada ----- One Year, 5.00
Foreign Countries ----- One Year, 6.00

To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.

Member of the Audit Bureau of Circulations.

The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

The Export Opportunity

IT is to be questioned whether manufacturers who refuse preferred orders from abroad for the sole reason that their output is already booked up to American dealers are not short sighted. At the present moment there is a large unsatisfied market just across the Atlantic and a manufacturer with a suitable car has a chance to make a foreign reputation that never will be repeated. When the automobile is suitable to the needs of the British or French market and a good foreign dealer comes along with his money in a bag it would surely be worth while to disappoint a few home dealers by reducing the number of cars they can secure by half a dozen or so, in order to get a footing over seas.

When hard times strike the home trade as one day they must do, the manufacturer with a substantial foreign connection will be in a much better position than a man who depends solely upon home trade.

This applies to parts makers as well as to manufacturers of complete cars, for it is obvious beyond all question that the British automobile trade are ready and anxious to buy in America what formerly they obtained from France and Belgium, and to buy more extensively, too. Had the home trade slumped this year the foreign demand would have still made 1915 a wonderful year, and, however insistent the American demand for cars and parts, the foreign market must not be neglected.

Light Weight Unanimity

THE consensus of engineering opinion that light weight chassis will be the next big development in automobile construction is remarkable. Lately the subject has been much under discussion and there is scarcely a man to be found now who sticks to the old argument of the heavy car. There used to be many who maintained for divers reasons, that high power and great weight produced a better car, where upkeep was not considered, than lesser weight and correspondingly lesser power. This notion is breaking down altogether and some engineers go so far as to predict the speedy demise of the 4000-lb. automobile.

The immense general interest in the subject among all branches of the trade and also in automobile clubs and places where users of car mostly congregate suggests that development along this line will be even more rapid than was at first anticipated. It suggests that the large, light car will soon be here in quantities and that every sale room will have to be equipped with a weighing machine before very many months have passed.

To multiplicity of cylinders, to automatic gearshifts and similar developments objections can be and are raised, but it seems the common sense of light weight is to have no antagonists.

Why Black?

WITH the time of the year when new models are settling down into regular production it is to be noticed that a few manufacturers are breaking away from the black finish that lately threatened to become universal. Of course, the reason for using black in the first place was that it was cheaper than a color and a little black enamel has a great covering power, but black is the very worst paint that could possibly have been chosen for automobile finishing.

Firstly, black shows the tiniest speck of mud or dust long before any other color and two cars starting out in the morning, one black and the other gray, will look totally different at the end of the same run. In a day's use in a town, even in good weather, a black car loses its freshly washed appearance almost at once, and by the afternoon it is dingy. On the other hand, a gray or blue, or brown, even a dark green or a maroon tint, will look fresh for days together.

Then again black is dependent absolutely upon its varnish, for without the gloss it rapidly takes on a rusty tinge like a hobo's coat, which no washing will ever remove. A colored car looks its best, of course, when the varnish is new, but when it has eventually gone dull it still lacks the seedy appearance of old black; it still looks fresh after a wash and the owner's pride in his car is generally more lasting. What's the use in washing a car that looks none the better for it?

The days of bright colors are gone perhaps; some yearn for brilliant reds and yellows, but good neutral tint browns and grays that both look well and wear well ought to be considered by manufacturers much more than they have been.

White to Increase Stock \$3,000,000

New Issue to Pay 7% War Truck Orders Render Extension of Plant Necessary

CLEVELAND, OHIO, Aug. 16—The White Co., this city, will issue \$3,000,000 new stock, according to an announcement made to shareholders. The greatest percentage of this new money, it was said, will be used for plant extensions, made necessary by war truck orders.

Although its operations are veiled with great secrecy, the White Co. is known to have been one of the heaviest makers of automobiles for war purposes.

To Retire Preferred

The present capitalization is \$500,000 preferred and \$2,440,000 common. The preferred will be retired immediately at \$115 a share plus accumulated dividends until Nov. 1 next, or 3½ per cent.

The new issue of the \$3,000,000 preferred will pay 7 per cent and will be sold to present stockholders.

Enger 12 at \$1,085

CINCINNATI, OHIO, Aug. 16—The Enger Motor Car Co. of this city has brought out a twelve-cylinder motor which is manufactured in the conventional twin-six V-type design. The dimensions of the power plant are 2% bore by 3½ stroke. The valves are in the head and the cylinder heads are removable. Other specifications of the car include 115 in. wheelbase, cantilever springs, streamline type bodies and 32 by 4 tires. The list price of the car is \$1,085.

Waverley Electric Price Reductions

NEW YORK CITY, Aug. 13—The Waverley Co., Indianapolis, Ind., will increase its 1916 production to 2000 cars, or approximately 100 per cent. A result of this proposed production is a general lowering of prices ranging from \$1,000 to \$500, effective Aug. 1, last. The following list gives the former and new prices:

Model	Old Price	New Price
108-5-Pas. Limousine.....	\$3,500	\$2,500
Roadster Coupé.....	2,000	1,750
109-Four-Chair Brougham.....	2,750	2,500
104-Front-Drive Four-Pas. Brougham.....	2,400	2,000
105-Rear-Drive Four-Pas. Brougham.....	2,350	1,900

New Empire Four at \$895

INDIANAPOLIS, IND., Aug. 16—The Empire Automobile Co., which recently announced a six-cylinder model at \$1,095 has in addition a new four-cylinder car which displaces the previous four. The new model lists at \$895 and has a new

power plant consisting of a 3% by 5 T-head motor fitted with Connecticut ignition and a Schebler carbureter, a cone instead of a disk clutch and a three-speed gearset. The rear axle is practically the same as that of the former four but the tires now are larger, being 33 by 4 instead of 32 by 3½. The body is an entirely new one, the wheelbase is 112 in.

Driggs-Seabury Ordnance Co. with \$4,000,000 Capital

NEW YORK CITY, Aug. 14—The Driggs-Seabury Ordnance Co., incorporated in Delaware last week with \$4,000,000 capital stock, will take over the control of the old Driggs-Seabury Ordnance Corp. The company's capital consists of \$500,000 first preferred stock, \$500,000 second preferred stock, and \$3,000,000 common. It is understood that the common stock will be put on the curb to-day by Herrick & Bennett. The preferred stocks will not be offered to the public.

The incorporators are C. M. Egner of Elkton, Md., H. L. Mullin and N. P. Coffin of Wilmington, Del.

The new company will take over the entire plant and assets of the corporation and will at once resume the manufacture of trucks and other war munitions and will take over the manufacture of about \$600,000 in truck parts, contracts for which were held by the corporation.

Borie for President?

It is understood that E. A. Borie, formerly vice-president of the Bethlehem Steel Co. is slated for the presidency of the newly organized company. Strong New York interests, among which is the banking firm of Wm. Morris Imbrie & Co., are connected with the new organization. The board of directors have not been announced, but the operating end of the business will be in the hands of former officers of the Bethlehem Steel Corp. The latter company states that it is not trying to buy out the Driggs-Seabury Ordnance Co., as rumored.

Woman Takes Chalmers Distribution for France

NEW YORK CITY, Aug. 13—The Chalmers Motor Company has announced that Helene Dutrieu, a prominent French aviatrix, has been appointed Chalmers distributor for all of France.

Hughes Falcon Chief Engineer

DETROIT, MICH., Aug. 14—W. S. Hughes has been appointed chief engineer of the Falcon Motor Truck Co. He was with the Findeisen & Kropf Mfg. Co., manufacturer of Rayfield carbureters, during the past five years, being with the Detroit branch during the last two years.

Coffin and Riker on Navy Board

Elected by Secret Mail Ballot of S. A. E. Members from Six Candidates

NEW YORK CITY, Aug. 18—At the headquarters of the Society of Automobile Engineers it was announced to-day that the successful candidates for election to membership on the naval advisory committee are A. L. Riker and Howard Coffin. The counting of mailed votes for the six candidates was made yesterday.

A. L. Riker is vice-president of the Locomobile Co. of America, Bridgeport, Conn., and is actively in charge of the engineering policies of this concern.

Howard Coffin is vice-president of the Hudson Motor Car Co., Detroit, Mich., and directs the engineering work of this company.

Mr. Riker was the first president of the Society of Automobile Engineers, serving for three terms. Mr. Coffin became S. A. E. president in 1910, and was the originator of the movement which has resulted in its great increase in size and activity since that time, the standardization of materials and parts being prominent examples. Both men have recently done effective work on the Membership Committee, the Finance Committee and the Miscellaneous, Electrical Equipment, Frame Sections and Nomenclature divisions of the Standards Committee.

Mr. Riker and Mr. Coffin were the directing officials of the mechanical branch of the Association of Licensed Automobile Manufacturers.

Mr. Coffin was educated in the engineering department of the University of Michigan. He served 5 years in the postal service. From 1902 to 1905 he was chief of the experimental department and chief engineer of the Olds Motor Works. In 1906 he was vice-president and chief engineer of the E. R. Thomas Detroit Co. and consulting engineer of the E. R. Thomas Motor Co. Subsequently he became chief engineer of the Chalmers-Detroit Co. and the Chalmers Motor Co.

Mr. Riker is an electrical as well as mechanical engineer. As early as 1888 he devoted attention to electric motors with a view to developing a type suitable for vehicle propulsion. It is understood that the Riker Electric Motor Co. produced the first toothed armature. Its first electric vehicle was brought out in 1894. In 1900 Mr. Riker built 5-ton electric trucks. He has been vice-president of the Locomobile Co. for 13 years. In 1900 he was awarded by the French Government a medal for car design.

Stearns Has Knight V Eight

3 $\frac{1}{4}$ by 5 Motor to Be Mounted in 123-In. Chassis—Five Body Types

CLEVELAND, OHIO, Aug. 17—An eight-cylinder V Knight motor has been added to the Stearns line and incorporated in a chassis which follows the line of the Stearns four described in this issue of THE AUTOMOBILE. The development of this type of motor is of interest due to the difficulty attached to the design of a V Knight motor and the resulting product has been made exceptionally clean. The engine has a fairly long stroke in proportion to bore, the dimensions being 3 $\frac{1}{4}$ by 5. The chassis in which the motor is fitted and the wheelbase of 123 in. and the body styles will include a seven-passenger touring, three-passenger roadster and a four-seated coupé. Limousine and landaulet bodies will also be marketed.

The new Stearns motor is the result of the experience gained after the construction of several experimental models. There are two eccentric shafts situated close together in the V, this position being the same as that usually occupied by the camshaft in a poppet engine. For driving these eccentric shafts a silent chain is used, but this drives one only, the second shaft being driven from the first by a spur gear. The gears are, of course, of same size, and are contained in a small chamber cast in the front end of the crankcase so that they can be used as the oil pump and they are naturally wide enough in face to deliver a large supply of lubricant at a high pressure.

Oil goes to a hollow crankshaft 2 $\frac{1}{4}$ in. in diameter and is thence taken to every point as the connecting-rods are hollow and serve as leads to the piston pins.

There is a double carbureter, and this is situated in the V, the exhaust manifolds being on the outside of each cylinder block, which makes for convenience and neatness. For electrical equipment a Westinghouse double unit system is employed and there is also a Remy distributor for ignition.

Side-by-side connecting-rods are employed after experiments with the forked type in conjunction with other experiments with the arrangement adopted, and the cylinder blocks are staggered 1 $\frac{1}{2}$ in. to allow for the rod layout.

Locomobile Grants 8-Hour Day and Withdraws Profit-Sharing

BRIDGEPORT, CONN., Aug. 12—The Locomobile Co. of America has granted an 8-hr. day to its employees and has withdrawn its profit-sharing plan. Fif-

teen hundred employees of the company at a mass meeting accepted a settlement with the company and will not go on strike. The company granted the demands made by the employees, with some exceptions. The new time schedule goes into effect Aug. 30.

The company did not agree to the demand that all hours over eight a day, or forty-eight a week, should be considered overtime, to be paid for at time and a half. The company will pay time and a half over 10 hr. a day. The men state that they will adjust that difference by refusing to work over 8 hr. a day. Night hands will not work more than 48 hr. a week and will receive a bonus of 15 per cent for that work. The wages for 48 hr. piece work will be the same as 55 hr.

Haynes Gets Restraining Order Against Sun Co.

BUFFALO, N. Y., Aug. 14—The Haynes Automobile Co., Kokomo, Ind., has been granted a temporary restraining order by the Circuit Court of Erie County, N. Y., August 12, restraining the use of the Haynes name in connection with that of the Sun light six, to be made by the Sun Motor Co., this city.

Bosch Gives Higher Wages

SPRINGFIELD, MASS., Aug. 12—The Bosch Magneto Co., employing about 1000 men, will put into effect on Sept. 1 an 8-hr. day instead of 9 $\frac{1}{2}$ hr., as at present. Piece work wage schedules will be increased, so that the employees will receive as much for 8 hr. as they are now getting for the longer day.

Spicer Machinists Demand 8-Hour Day

PLAINFIELD, N. J., Aug. 12—At a meeting of the machinists employed by the Spicer Mfg. Co., it was decided to give the management until to-morrow to grant an 8-hr. day, on pain of a probable strike. Seven hundred men are affected.

Standard Welding Co. Expands

CLEVELAND, OHIO, Aug. 17—The first addition to the Standard Welding Co. plant is nearly completed. It is a brick building 100 by 200 ft. facing West Seventy-fourth Street. This building is to be devoted entirely to the manufacture of bent tube parts.

The second addition is to be of the mushroom reinforced concrete type built in the form of an L. One leg will extend 200 ft. north and south on West Seventy-third Street, the other leg 240 ft. east and west from West Seventy-third to West Seventy-fourth Street.

Later two more additions will be built parallel to the Seventy-third Street section and connecting with the main building. Double railroad sidings will enter between each section, giving excellent shipping facilities.

Detroit Plants Run at Capacity

Many English Dealers Want Cars—Retail Sales Recover from Slack Condition

DETROIT, MICH., Aug. 16—There was little change in the manufacturing and sales conditions of the manufacturing field of this city nor of the local selling of cars during the past week. Manufacturers are all running full tilt, and dealers say that the territory served by this city is in healthy condition, with a pleasing contrast to the war and panicky conditions which affected business for the corresponding period of last year immediately following the declaration of the great conflict.

It is rather a surprising fact that there are so many of England's representative dealers in cars in this country at this time, but they are here with the sole intent of buying cars, and they have plenty of money to buy them with. Naturally they come immediately to Detroit, and there were several Englishmen in the city last week seeking to place large car orders. In fact the English field is strongly demanding Detroit vehicles, but they are hard to get, so tied up are the factories with domestic business at this time.

While the rainy weather conditions which have prevailed most uniformly all over the country were somewhat improved last week, allowing the resumption of the dealer crusade, the slackening of retail sales which this weather necessarily was responsible for was only temporary, for with the coming of more sunshine the rush is on again, if indications as echoed here are any criterion. In fact, the weather has had no slackening effect upon the activities of the factories, which are still as pressed as ever since the opening up of the season.

Raw Materials Scarce

There is one aspect of the business situation with the Detroit plants that bids fair to becoming a serious thing if the resourcefulness and business acumen of the motor car fraternity do not find some way of getting around it. That is the growing shortage of certain of the raw materials that are all important to the car maker and the parts and accessory manufacturer as well. Take iron and steel, for instance. The war orders and war business with the suppliers of these materials have curtailed greatly the supply which they have for domestic trade, and prices are bound to be affected by this dearth of the requisite materials. Iron castings are becoming harder to get, as well as those made from other metals.

Detroit Plants Need Workmen

Great Shortage of Skilled Labor Prevents Many Factories from Capacity Work

DETROIT, MICH., Aug. 14—There is still a great shortage on skilled labor in the local automobile and parts manufacturing concerns. Notwithstanding advertisements in local and out-of-town papers and standing orders with employment agents, many plants are not being run to full capacity on account of their inability to get all the men they need.

Under normal business conditions it would be possible to get these men, but since so many manufacturers outside of the automobile industry have started to make what is generally termed war materials for the European countries these concerns have been enlarging their plants and increasing their production, and in adding new men have given the preference to those formerly connected with the automobile industry. In fact, it is reported that agents from such manufacturers, also employment bureaus, have been offering increased wages to men now employed in local automobile and parts factories.

Advertise for Workers

The Packard Motor Car Co., which now has 8200 men on its pay roll, which is the largest number in its history, has been advertising for the last five or six weeks for such workers as all-around machinists, hand and automatic screw machine operators, drill press and milling machine men, drop-forge hammer men and heaters, J. & L., Gisholt and P. & J. operators, tool makers, panelers.

The Continental Motor Mfg. Co. has been advertising for tool and crankshaft lathe hands, grinders, punch press operators, J. & L. and hand-screw machine operators, block testers and braziers.

The Chalmers Motor Co. wants tuners, first-class machinists for experimental department, inspectors and electricians, lathe hands, W. & S., B. & P. & W. screw-machine hands, Lanis grinders, cutter grinders, Acme, Cleveland and Gridley automatic-machine hands.

The Russell Motor Axle Co. needs rear-axle assemblers. The C. R. Wilson Body Co. needs body finishers, door hangers, wood milling machine men.

The Maxwell Motor Co. has been advertising for weeks for tool makers, tool lathe hands, screw-machine operators, P. & J. operators, crankshaft lathe hands, inspectors.

The Auto Parts Mfg. Co. requires Healy cylinder grinders and Gisholt men. The Sterling Motor Co. is advertising

for bearing scrapers and motor assemblers.

The Kelsey Wheel Co. needs B. & O. operators. The Rands Mfg. Co. desire experienced windshield assemblers. The Briscoe Mfg. Co. needs more die makers. The Fisher Body Co. is in need of No. 1 aluminum panelers on enclosed bodies. The American Auto Trimming Co. is in need of final assemblers, applying hardware on finished bodies. The Detroit Nut Co. has room for B. & S. automatic screw machine operators and machinists.

At many other plants, such as Dodge Bros., the Cadillac Motor Car Co., the Hayes Mfg. Co., and the Briggs Mfg. Co., it was stated that men are being added to the force when found to be skilled workers in the kind of work for which they apply.

Homes for New Employees Pontiac Manufacturers' Problem

PONTIAC, MICH., Aug. 13—At a meeting of many of the city's business men, especially manufacturers or their representatives, it was recognized by all that something will have to be done quickly to meet the urgent local requirements for more houses for workingmen, otherwise the expansion of the manufacturing concerns may be halted.

1000 to 1200 More Men

Briefly stated, between 1000 and 1200 more men will be employed by the plants this year, and according to an investigation, out of 176 houses found available only fifty-one were found to be up to date, modern and entirely acceptable, while fully 20 per cent were undesirable.

Such men as Charles B. Wilson, president of the Wilson Foundry & Machine Co.; W. D. Kelly, factory manager of the Oakland Motor Car Co.; W. L. Day, vice-president and general manager of the General Motors Truck Co.; O. J. Beaudette, president of the O. J. Beaudette Co., and many others spoke earnestly about the conditions and made it plain that the city and its citizens must get together and do something at once. A suggestion was made for the formation of a stock company which would build at least fifty houses which could be rented at \$20 a month or less or sold on monthly payments.

Fifty Oldsmobiles a Day

LANSING, MICH., Aug. 12—Reports received at the Olds Motor Works from its distributors and dealers show that business is far ahead of last season in practically all the country. It means that production will have to be increased. At the present time, in fact for some time, fifty four-cylinder cars have been the average daily output, and this schedule will be maintained indefinitely. Production on the eight-cylinder car will materially increase the daily output.

N. Y. Sales Continue To Gain

Dealers Begin To Get Calls for Enclosed Bodies—Some Are Sold Out

NEW YORK CITY, Aug. 17—Good weather and the return to the city of vacationists were responsible for a brisk sale of automobiles last week. The dealers report that sales are remarkably large, when it is considered that the month of August has been in former years a poor month. Many inquiries are coming in now for winter cars and a few of the dealers are making sales in closed cars.

A number of the dealers are at present doing no business, being completely sold out, some of them as far back as five weeks. A few of the low-priced agents have been waiting nearly two weeks for deliveries of the 1916 models and report that without even a demonstrator, they are making large sales.

Harry S. Houpt, the Hudson dealer, has set a sales record, his books showing that he has disposed of more than 500 cars since June 10. C. T. Silver, president of the C. T. Silver Motor Co., Overland dealer, reports that he has recently lost a number of sales owing to his inability to make delivery immediately to persons who wanted to drive the cars away from the showroom. He expects to be able to make fairly prompt deliveries in a week.

Some Make Bonus Offers

The Briscoe agent was sold out five weeks ago and is waiting for the 1916 cars. Buick has every car sold for two months. This agency reports that if it could get immediate deliveries, fifty to sixty cars a day could be sold. Buyers are so urgent in their demand for cars that a number of them are making large bonus offers to procure cars.

Sales this week are heavier than ever and the floors of the agencies, especially in the low- and medium-priced cars, were crowded with prospective buyers. A number of the dealers with high-priced cars were also busy last week. Simplex reports good sales and is sixty-five cars ahead in sales. It is just beginning deliveries. The Pierce-Arrow agency, which has a few cars on hand, had quite a number of inquiries for cars last week. Sales are normal. The Packard company is completely sold out.

The Mitchell agency reports good sales during last week. It is fifty-two cars behind in orders. Many inquiries are coming in on closed cars. Last week twelve closed cars, with specially built bodies, made in this city, were sold.

The Maxwell company has just received a fresh shipment of cars. Sales

for the month will amount to over 100 cars. Sales for last week up to last Saturday amounted to twenty-nine cars. The company is expecting a large business in September when a majority of the automobile buying public will have returned from the summer resorts.

Even now there are a large number of people who want cars for summer touring. The dealers report that motorists this year are using their cars more than ever for vacation purposes and state that in general this is responsible for some of the large sales records.

Sales Good in Missouri and Adjoining States

ST. LOUIS, Mo., Aug. 9—The great majority of automobile dealers in the St. Louis district—including Missouri and its adjoining States—found business during the last week ranging from "Normal" to "Best in the history of the industry." A few reported a slackening in the rush for cars—due chiefly to the fact that farmers are too busy harvesting to find time to spend their rapidly accumulating wealth—but even these dealers said all indications pointed to unusually heavy sales in the near future.

Moon 33 per Cent Gain

The Moon company claimed a 33 per cent increase over last year's business and said conditions were especially rosy in the northern parts of the Central States. "Our only trouble," the sales manager said, "is in getting parts fast enough. We have more orders than we can fill now."

The Maxwell dealer here said, "Never in my life have I seen the automobile industry so healthy. We are working day and night filling orders."

The Federal Truck distributors said they were doing 400 per cent more business now than during a similar period last year. The Hudson-Phillips and Chalmers people enjoyed normal business.

Inter-State Behind Orders

INDIANAPOLIS, IND., Aug. 13—Increasing orders for Inter-State automobiles has caused the factory at Muncie to be 300 cars behind and will necessitate the doubling of the present force of workmen, numbering several hundred. It is hoped to have 300 new men at work by Sept. 15. Lack of workmen because of the great demand for them created by automobile parts companies and others engaged in supplying automobiles and accessories to the allies in the European war, has delayed the Inter-State company from increasing its production as rapidly as it had desired. All shipments to dealers are now pro-rated. Part of the increased demand, also, is due to the drop in price from \$1,000 to \$850.

Kelly-Springfield Tire Rushed

Is 27,000 Tires Behind Orders
—Will Earn 27 to 30 Per Cent on Common

NEW YORK CITY, Aug. 14—The Kelly-Springfield Tire Co. is now 27,000 tires behind orders. As the company manufactures between 1000 and 1100 tires a day, this means that it is approximately a month behind orders on its books. The Akron, Ohio, plant continues to operate at capacity, and officials say that business on hand in sight insures a continuance of this rate of operation throughout the remainder of the year.

The company recently entered the truck tire field. By the first of the year it is estimated that it will be possible to make 400 truck tires a day. Enlargement of the plant in order to make this a possibility is now under way. These tires will sell from 10 per cent to 15 per cent higher than the average truck tire.

The directors estimate a rock-bottom earning of about \$1,500,000 for 1915. Allowing for the difference in dividends after conversion of preferred into common this would mean close to 27 per cent for the common shares. Net may run as high as \$1,700,000. It is expected that the company will distribute a substantial extra cash dividend this fall.

Record July Shipments of 12,515 Carloads

NEW YORK CITY, Aug. 14—Continued heavy demand for automobiles is reflected in the traffic statistics of the National Automobile Chamber of Commerce. The figures indicate shipment of 12,515 carloads in July, compared with 4870 carloads in July last year. These figures easily establish a new high record for automobile shipments at this season and the railroad earnings on this traffic are now well over \$1,000,000 a month.

Pontiac Plants Rushed—Unfilled Orders Large

PONTIAC, MICH., Aug. 13—According to a statement made by W. D. Kelly, factory manager of the Oakland Motor Car Co. that concern now has orders for 11,000 cars all of which are to be ready for shipment by Jan. 1, 1916. There are 511 men on the pay roll now and the force is to be increased by at least 200.

Orders for 500 Trucks

W. L. Day, vice-president and general manager of the General Motor Trucks Co. stated that the company has orders now for at least 500 trucks and that the number of unfilled orders on the books

is greater than the total number of trucks shipped during an entire year during any year except the fiscal year just ended. This past year has been the best in the history of the company and showed after all bills had been taken care of a net balance of \$250,000 in the treasury. The company will add 100 men.

The Wilson Foundry & Machine Co., according to president Charles B. Wilson, will eventually make all the cast iron and machined parts for the Willys-Overland Co., Toledo. During the week the company acquired further land bringing its total up to 21 acres. Mr. Wilson stated that just as the Willys-Overland Co. grows so it will be with his concern, and every further expansion of the Toledo concern will mean a further needed expansion of his company. The Wilson company will add 600 men.

The American Forge & Socket Co., a new concern, is to employ seventy-five to 100 men.

Other Concerns Increase Forces

The Hess-Pontiac Spring & Axle Co. which added about 150 men recently will need at least fifty more. A score of other concerns are also adding or will add more men to their force.

Northway Motor to Double Space

DETROIT, MICH., Aug. 14—Additions now being erected, together with a new building not yet started, will eventually double the floor space of the Northway Motor & Mfg. Co. and bring the total up to 450,000 sq. ft. When completed the working force is to be increased, and it is said that about 4000 men will then be on the pay-roll.

Velie Factory at High Speed

MOLINE, ILL., Aug. 13—Changes are being made at the factory of the Velie Motor Vehicle Co., Moline, Ill., to facilitate increased production.

The six-story building heretofore used for storage purposes will now hold the final assembly departments and shipping rooms. With this new arrangement rough material is received at the west end of the main plant and finds its way through the machine shop, first assembly and test, hence to the final assembly, where the bodies await installation after which the completed cars are shipped without delay or further handling.

All Velie factories in Moline are working overtime. The truck factory is handling two large European orders for heavy-duty trucks.

Oldsmobile Sells Buffalo Branch

BUFFALO, N. Y., Aug. 14—The Buffalo branch of Olds Motor Works, has been bought by Louis Engel, Jr., who will conduct the business under its former name, the Oldsmobile Co. of Buffalo.

200 Per Cent Gain in Los Angeles

Arizona and Southern Cal. Agents Order Carloads—Allotments Dwindle

LOS ANGELES, CAL., Aug. 10—Heat seems to be a stimulant to the automobile industry in Southern California. The opening days of August, the hottest of the year, have brought a great increase in the car sales of Los Angeles, Southern California and Arizona.

100 per Cent Gain for Week

The total business of the representative Los Angeles dealers shows a gain of more than 200 per cent for the first week of August, 1915 over the first six working days of August, 1914. An increase in business of almost 100 per cent is reported for the first week in August of this year over the first week of July.

Almost 600 Maxwells have been sold by the Lord Motor Car Co., since the new car was announced here Aug. 1. Six carloads arrived in Los Angeles, Aug. 8, were unloaded and delivered early the following morning, leaving the agency without a car except the two demonstrators which arrived the day before the announcement of the new models was made in this city. The suburban dealers are ordering cars in great numbers. In one day, Aug. 9, six carloads were ordered over the wire by agents in Arizona and Southern California towns.

The Los Angeles Ford plant is working hard to keep up assembling on an average of fifty cars a day.

The run on the new Overland continues. Since Aug. 1 forty cars have been delivered by the J. W. Leavitt Co., in this city and if the cars had been available, the local manager, L. V. Starr, claims that he could have delivered eighty or 100 machines. The new Willys-Knight has in no way affected the sales of the Overland. Twenty-nine of the new Knight machines have been delivered in this territory since Aug. 1.

The Packard Twin-Six has made a hit in Los Angeles. The demonstrator has not been in service here quite two weeks, yet more than a fourth of the entire allotment for Southern California 200 cars have been sold by Earle C. Anthony, although no deliveries can be made until about Sept. 10.

400 Orders Behind

The Howard Automobile Co., Los Angeles Buick dealers, is 400 orders behind now. The company is making deliveries right along through its sub-agents and at the main salesroom in this city, but the cars sell faster than they can be shipped out from the factory.

The new Cadillac reached Los Angeles to-day. The 1916 model caused almost as great a sensation as the arrival of the first "eight," more than nine months ago.

The Reo is being well received in the suburban cities. Earle C. Anthony contracted for 1500 cars for the entire State this season and with five carloads going at wholesale during the past two weeks, just to the Southern California sub-agents, it begins to look as if the 1500 cars will not be enough.

Dodge Bros. car is one of the most popular in Southern California at this time. Harold L. Arnold, Los Angeles dealer, has sold and delivered 586 Dodge cars since Jan. 1 and eighty-one cars this month.

Hawley, King & Co. have sold twenty-five more Oakland cars already this month than during the first half of July. Wm. R. Ruess, Stearns-Knight and Mitchell distributor, has sold eighteen cars in the past seventeen days. Ralph C. Hamlin has sold seven more Franklins and five more Scripps-Booth machines the first ten days of this month than during the first ten days of July. The Enger dealers, Irving Motor Car Co., sold three more cars this month than during the same ten days of last month.

Truck Sales Brisk

Truck sales have also been brisk during the opening days of August. Last month nine Mack trucks were sold during the first ten days. This month the Mack Motor Truck Co. has sold fourteen trucks.

The Studebaker Corp. sold 150 cars at retail in Los Angeles for the month of July and with fifty cars sold during the first ten days of August, this month promises to be the best in the history of the branch here.

Holley Business Better

DETROIT, MICH., Aug. 14—In comparison with business during the first half of 1914 Holley Bros., carburetor manufacturers, report that their business thus far this year has been twice as heavy. Conditions are better all around, and the outlook for the future is excellent. The plant will be running to its full capacity for an indefinite period.

Kelsey Wheel Adds

DETROIT, MICH., Aug. 14—The Kelsey Wheel Co. has now under construction additions which will increase its plant by nearly 80,000 sq. ft. of floor space. Officials of the company say that business thus far this year shows an increase of more than 25 per cent over the corresponding period in 1914. From reports received by the company from all parts of the country indications point to a banner year for the automobile industry as well as the allied industries.

70 Morton Tractors to Russia

Many Orders on Hand—U. S. Army Officials Test Machines—Plant to Be Enlarged

HARRISBURG, PA., Aug. 13—The Morton Truck & Tractor Co., this city, has completed and now has on the sea to Russia seventy tractors, which is a small part of an order received several months ago from the Russian Government. The tractors, which left New York last week, are of 60-hp. rating, weigh about 6 tons each and are capable of making from 2 to 10 miles an hour with a draw-bar pull of 8,500 lb.

Many Orders Going Through

This is the first shipment of an original order of 300 of this style of tractor, and there is now in course of construction at the local plant eighty 3-ton Morton trucks for the same government, as well as seventy-five high-powered armored cars capable of carrying two machine guns mounted on revolving turrets and an assignment of six men. The company also has additional orders for 80 and 120-hp. tractors, and for many more motor trucks from both the Russian and French governments, while the United States Government engineers have been inspecting the work of both tractors and trucks.

Th armored cars which are now being constructed have a six-cylinder motor of 125 hp., and are of the regular Morton type. While in London during the winter Robert L. Morton designed the armored car after the needs expressed by representatives of the Russian government.

Carry Two Guns, Men and Supplies

In addition to carrying its two guns and men the cars carry 50 lb. of ammunition for each gun and the necessary spare parts to keep the cars in active service. The guns and men are protected by armor plate of a thickness capable of withstanding nickel bullets of muzzle velocity of 2750 ft. per second at a range of 15 yd. Tests of various steels, both in this country and abroad, were made, and a special heat-treated steel of the Pennsylvania Steel Co. proved the most satisfactory. In the tests this steel withstood fourteen shots within a 3-in. circle, while most of the other steels were pierced or cracked.

Factory Increased

The plant of the Morton company has been greatly increased, and negotiations are now on for more grounds for additional buildings. Day and night forces are working, and the big orders have

made it one of Harrisburg's leading industries.

The tractors and trucks have many features, the most prominent being the four-wheel double-worm drive, with the flexibility of the four wheels under uneven road conditions. The worm is self-contained in the axle case, with its universal joint within the worm on the tractors, allowing great flexibility and full drawing power from all wheels. There is an automatic stop for the engine steel, and the trucks are equipped with both engine and hand steering devices.

Foreign government officials are almost constantly at the local plant conducting tests of the finished tractors and trucks, and every machine finished has more than met with all the requirements asked by the visiting officials.

To Build Studebakers for Foreign Trade in Canada

WALKERVILLE, ONT., Aug. 13—Canada's automobile industry will receive a decided impetus through the decision of the Studebaker Corp. just announced, to build all its cars for the foreign market in its Canadian factory in Walkerville. This decision means the employment of several hundred skilled workmen and the operation of the Canadian plant to full capacity during the entire year. Heretofore Studebaker cars for the foreign trade have been built in Detroit, but an investigation proved that this branch of the business could be carried on much more economically and efficiently from Canada, and as a result, the output of the Studebaker factory in this town will be multiplied several times. Already work has started on fitting up the Canadian plant to meet the increased demand, and in a short time upward of 500 men will be employed. New traveling cranes and air compressors installed, rubbing decks and finishing rooms built and railway sidings re-arranged and increased.

Wetmore Laboratories for Test Work

MILWAUKEE, WIS., Aug. 14—The Wetmore Mechanical Laboratories Co., Milwaukee, has been organized with \$20,000 capital to do inventive, research and test work for manufacturers. The concern intends to specialize in the development of motor car parts. C. P. Wetmore, until recently general superintendent of the Dial Cash Register Co., Milwaukee, and an engineer of note, is at the head of the new company. A laboratory and machine shop will be established in Milwaukee on Sept. 1.

Kidd Paige Representative

DETROIT, MICH., Aug. 16—S. W. Kidd, formerly with the Briggs-Detroit Co. has been appointed a district sales representative by the Paige-Detroit Motor Car Co.

Ford Averages 1027 Cars a Day

Total of 308,213 Built in Fiscal Year — Estimate 4000 Daily Now Possible

DETROIT, MICH., Aug. 16—Based upon 300 working days for the year, the average daily production at the Ford Motor Co. during its fiscal year which ended July 31 was 1027 automobiles, as the company just announced that a total of 308,213 Fords had been built and sold between Aug. 1, 1914, and the end of July, 1915.

When the total output of the Ford company for its past year is analyzed it is obvious that, big as the total is, it is far from what the actual output of that concern would be when work is performed under pressure; that is to say, when day and night shifts and a full force of 20,000 men or more is working, as was the case in March, April and May.

2096 Cars in 1 Day

It was March 17 that the record production of 2096 cars in one day was established. A few days later 2026 were made. April there were also days when the 2000 cars a day schedule was maintained. The total for April was 46,510 cars, the biggest month in the Ford history. In computing these figures with the more recent activities at the plant it will be remembered that on July 16 car No. 300,000 of the 1915 output was completed. In the fourteen working days from July 16 to 31 the total output of Fords was 8213, or at the rate of only 586 cars a day, or 1510 less than the March record day and 441 less than the daily average for the whole past season.

Speaking on the subject of output, an official of the company said: "I believe that this year a production of more than 4000 cars in one day will be possible. No special effort was made during the past season when we reached the 2000 mark. It was merely a test to see what we could do under normal conditions. Furthermore, at that time few of our assembling plants were all working under full pressure. By Jan. 1 the production facilities will allow every assembling plant to assemble from seventy-five to 150 cars a day. Some of the plants, like Philadelphia, Los Angeles, San Francisco, Long Island City, Chicago, will be supplied with sufficient stock to turn out 200 or more cars a day. However, if such an output will be maintained for any length of time is something no one can predict. We are sure about one thing, and that is that we are in a position to meet any emergency in so far as producing cars is concerned.

If we received an order for 50,000 cars to be completed in 2 weeks I have not the slightest worry that every one of them would be ready 24 hours before the day stipulated.

"There are two all important factors to be taken into account with regard to quantity production such as we turn out. First, the raw and other materials needed for such production, and secondly, the public demand.

56,000 Behind Orders

"There is no question that the Ford company could have and would have made and sold at least 25,000 more cars during the past season. As a matter of fact, there have been from 50,000 to 60,000 back orders on the books for the last six months. The one and only reason of not making as many cars as could have been sold was the lack of needed material. If present conditions prevail for any length of time not only the Ford company but many other concerns will be greatly affected in making as many cars as intended. The tremendous amount of war orders is taking precedence over everything else with the steel mills and other plants which furnish raw materials. The agents from the foreign countries are willing to pay any price to be served first and there are plenty of instances to be cited where the automobile manufacturers find that they have but little to expect, and must look elsewhere for their requirements."

From Five to 1027 a Day

The accompanying table will give a correct idea of the growth of production at the Ford Motor Co. since this concern has been in existence:

YEARLY OUTPUT OF FORD CARS			
Year	Total Output of Cars	Increase or Decrease	*Daily Average
1903-1904	1,708		5
1905	1,695	— 13	5
1906	1,599	— 96	5
1907	8,423	+ 6,824	28
1908	6,398	— 2,025	21
1909	10,607	+ 4,209	35
1910	18,664	+ 8,057	62
1911	34,466	+ 15,802	115
1912	68,544	+ 34,078	228
1913	164,452	+ 95,908	545
1914	248,307	+ 83,855	827
1915	308,213	+ 59,906	1,027
Total 12 years	873,076		

*Based on 300 working days.

According to Ford salesmen, as well as to state registration records, it appears that 80 per cent of the Ford cars sold in 1915 were touring cars, 15 per cent were runabouts and the remaining 5 per cent consisted of town cars, coupes and sedans.

\$15,410,650 in Rebates

Based upon these percentages, the Ford company sold 246,570 touring cars having a total value of \$110,819,300; 46,231 runabouts having a total value of \$20,341,640 and 15,402 town cars, sedans and coupes of an average value of

\$800, or a total value of \$12,341,600. This brings the total estimated value of the cars sold by the Ford company in 1915 to \$143,502,540.

To the purchasers of the 308,213 cars sold during the past season, the Ford company will return as a rebate a total of \$15,410,650.

\$500,000 Ford Assembly Plant for Oklahoma City

OKLAHOMA CITY, OKLA., Aug. 13—The Ford Motor Co. will build a \$500,000 fireproof assembly and service plant here to employ 300 men. Construction will begin in September. It will have 180,000 sq. ft. of floorspace.

Since the Ford company commenced doing business in Oklahoma, the company has enjoyed a fine business. Up to date, the company has sold 16,000 cars. Last year 4000 were sold, and according to J. M. Morris, the assistant manager of the local branch, this branch could have sold 4000 more. The estimate for the next year, which dates from Aug. 1, has been placed at 11,500 for this State.

On the ground floor will be the 50 by 75 ft. display and salesrooms. At the rear of the salesroom will be the store room and garage, which will be 200 by 75 ft. The manager, assistant manager, and the head of the wholesale department will have private offices on the second floor.

Painting, upholstering, car assembling and storing of stock will use the entire third and fourth floors. An electric sign will top the building.

Chicago Sales Good Despite Severe General Rains

CHICAGO, ILL., Aug. 17—Reporting on trade conditions in Chicago, Reo has done 50 per cent more business this week than last, and in the first 2 weeks in August there was 100 per cent increase over the same period last year. Locomobile reports extraordinary business the past few weeks, about 50 per cent more than same period last year. Pierce-Arrow business is quieter now and has been since Aug. 1, because many customers are out of the city. Nothing was done last year at this time but a few sales are being made now. Dodge reports business not so active during the last 2 weeks on account of the severe general rains. Many dealers have cars on the floor which they cannot deliver on account of mud. Studebaker reports twice as many orders as at this time last year.

Nesbitt Directs King Advertising

NEW YORK CITY, Aug. 18—W. B. Nesbitt of the Ward & Gow Agency, New York, has been appointed advertising manager of the King Motor Car Co., Detroit. Ward & Gow have complete and exclusive charge of King advertising.

New Series Genemotor Is Out

G.E. Electric System for Fords Awarded Gold Medal at Coast Exposition

NEW YORK CITY, Aug. 14—A. J. Picard & Co., this city, general distributors of the Genemotor starting and lighting systems for Ford cars, manufactured by the General Electric Co., have completed their plans for the distribution of the new series Genemotor which has just been brought out. The Genemotor was awarded the gold medal at the Panama-Pacific International Exposition. The new series incorporates a number of improvements which are designed to make the system more reliable and to fortify it against the possibility of misuse in the hands of the novice.

Two particular improvements are to be noted in the new series, which is the second model of Genemotor offered since Jan. 1. These are a double-point contact relay and a flexible driving pinion which is designed to eliminate chain trouble. The new contact relay arrangement enables the generator to start charging the battery at a lower car speed than before; on high gear the battery starts charging with the new model at a car speed of 9 m.p.h.

The reduction of speed at which the battery charges is due to changes in the electrical characteristics of the Genemotor and also to the employment of the improved reverse current cutout, which has a double instead of a single contact. With the lower charging speeds drivers who travel at an average speed of 15 m.p.h. or less will not be troubled by a shortage of current available for operating their lamps.

The flexible driving pinion is a cushion sprocket much along the lines of that used during the past season, but improved in details of construction to provide smoothness and adjustability. The price remains \$75.

Swan Carbureter Gets Medal

SAN FRANCISCO, CAL., Aug. 12—The Swan Carbureter Co. this city has been awarded the gold medal at the P. P. I. E. This is the highest award made to any carbureter exhibited there.

Bowser's Summer Convention Closes

SOUTH BEND, IND., Aug. 14—The annual summer convention of the district sales managers of the S. F. Bowser Oil Tank & Pump Co., Fort Wayne, was held at the home office last week. The meeting was for the purpose of discussing winter sales policies, president S. F.

Bowser addressing the meeting, S. B. Bechtel, general manager presided over the meetings. Those attending were western manager B. F. Savercool, San Francisco; L. J. Little, Fort Wayne; B. L. Prince, Dallas; W. M. Mann, Albany; W. R. Hance, Toronto; H. C. Carpenter, Jr., New York; R. S. Colwell, Harrisburg; H. W. Brown, Atlanta; T. D. Kingsley, Chicago; G. H. Hastings, St. Louis; A. W. Dorsch, Washington, D. C., and E. J. Gallmeyer, Louisville.

100 Chalmers Service Men in Annual Convention at Factory

DETROIT, MICH., Aug. 16—To-day and to-morrow over 100 of the service men of the Chalmers Motor Co. are taking part in the annual convention which is being held at the plant.

At to-day's meeting president Hugh Chalmers greeted the service men and talked to them on the Chalmers' 1916 policy and plans. Vice-president C. A. Pfeffer also greeted the visitors. Sales manager Paul Smith outlined the object and plans of the convention. Chief engineer C. C. Hinkley spoke about valve-in-head overhead camshaft motors. Service manager A. B. Hanson introduced the service men to the heads of the various divisions of his department and under the direction of vice-president in charge of works S. H. Humphreys, the service men made a tour of the plant. During the afternoon a trip to Grosse Pointe was taken and in the evening a dinner was served at the Ponchartrain Hotel.

Tuesday's session will open with a general discussion on service. This will be followed by a discussion of the Chalmers 6-40 motor which will be illustrated with practical demonstrations. Other speakers are to be A. Atwater Kent, president of the Atwater Kent Mfg. Co., Philadelphia; H. F. Willard, manager of agencies of the Willard Storage Battery Co., Cleveland; Frederick Purdy of the Findeisen & Kropf Mfg. Co., Chicago, manufacturer of the Rayfield carbureter; H. S. Barter, of Gray & Davis, Boston, will talk on the Gray & Davis starting and lighting system.

During the afternoon there will be an open meeting presided over by chief engineer Hinkley and in the evening a dinner and entertainment at the Ponchartrain Hotel.

Bondholders to Buy Speedwell Plant

DAYTON, OHIO, Aug. 12—Bondholders of the defunct Speedwell Automobile Co. have decided to purchase the plant when it is sold at public auction on Sept. 1. The plant will continue to be occupied by the Record & Computing Machines Co., which holds a 15-year lease on the property.

New Process Gear Buys Plant

To Take Over Monarch Typewriter Factory Oct. 1—To Employ Over 1000

SYRACUSE, N. Y., Aug. 17—The New Process Gear Corp. will acquire ownership of the Monarch typewriter plant, Syracuse, Oct. 1.

The buildings of this plant cover 2 acres, and the surrounding land, which adjoins the property of the New Process corporation, includes an additional 3 acres. The main building is five stories high, is of brick and slow-burning mill construction. After alterations the Monarch plant will be used by the New Process Gear Corp. as the job gear and spur and transmission department and the present plant will be devoted exclusively to the manufacture of automobile differentials.

It is the intention of the corporation to have more than 1000 employees at work before spring, at which time the additional five-story building now being erected on property purchased recently will be completed and equipped.

277 More Cars for Delaware

DOVER, DEL., Aug. 13—The State of Delaware received 277 new registrations during the month of July, bringing the total number of cars in that State up to 4412, there having been 4135 cars registered up to July 1. The list of licensed owners and their cars, issued by G. H. Hall, Secretary of State, shows that the Ford car leads in number, followed in order by the Overland, Maxwell, Studebaker, Buick, Hudson, Cadillac, Pierce, Paige, and Packard.

The following list gives the name of the car and the number registered during the month of July:

Name	Number	Name	Number
Ford	68	Cadillac	7
Overland	21	Pierce-Arrow	7
Maxwell	17	Paige	5
Studebaker	16	Oldsmobile	5
Buick	13	Packard	4
Hudson	9	Mitchell	4

Maxwell Denver Service Branch

DENVER, COL., Aug. 13—The Maxwell Motor Co. has opened a distributing and service branch in Denver at 1248-1254 Broadway. The new branch is run under the name Maxwell Motor Sales Corp., with D. S. Eddins as district sales manager, W. N. Lindberg as service branch manager and N. B. Walsh sent here by the factory to take charge of the extensive stock. Mr. Eddins formerly traveled in Texas for both the Maxwell and the Studebaker people and Mr. Lindberg, who has been with the Maxwell

concern several years, recently opened the company's new branch in Pittsburg.

The business will be under the general direction of Zone Supervisor John Yoke, who also has charge of the business in the Kansas City and Texas districts. This is one of sixteen branches being established by the company throughout the United States.

The Denver branch will supply Colorado, Wyoming, Utah and New Mexico.

Hercules Motor Car Co. Plant Bid In for \$20,800

NEW ALBANY, IND., Aug. 14—The property of the Hercules Motor Car Co. was sold here to-day by County Sheriff Charles W. Long. The plant was bid in by E. B. Stotsenburg, attorney for the bondholders, at \$20,800. The value of the property is estimated at \$40,000. For the present, it was announced following the sale, the plant will be occupied by the Hercules Sales Co., which has it under lease from the receiver. The Hercules Sales Co., which has its headquarters in Louisville, Ky., took over the patterns, name of the car and blueprints of the Hercules Motor Car Co. the first part of this year, while the Kentucky Wagon Mfg. Co. is manufacturing Hercules cars, an agreement to that effect having been made in March with the Hercules Sales Co.

It is rumored that the plant will pass into the hands of the Kentucky Wagon Mfg. Co., the Ford Motor Co. or the Studebaker Corp.

The property consists of 6½ acres, on which are half a dozen two-story and three-story buildings, together with the machinery of the plant.

The sale was made on a decree issued by Judge John M. Paris in the Floyd Circuit Court in a foreclosure suit of the Fidelity & Columbia Trust Co. of Louisville, trustee for first mortgage bondholders, against the Hercules Motor Car Co., the Hercules Sales Co. and others. The term "others" includes about 100 stockholders in various parts of the country, who hold stock certificates to the amount of \$110,325.

The bonds amount to \$19,865; the judgment is for \$20,658.76, including interest and attorneys' fees, which, with court costs and the expense of the sale, bring the aggregate up to \$21,285.02. The amount realized does not quite cover the judgment and costs.

Elwood Iron Works Petitioned

CHICAGO, ILL., Aug. 14—An involuntary petition in bankruptcy was filed to-day in the Indianapolis federal court against the Elwood Iron Works, Elwood, Ind. This concern planned to manufacture the Elco 30, rights to which later were secured by the Bimel Buggy Co.

Bay State Headlight Regulation

Measure Probably Will Go Into Effect Oct. 1—Test 40 Dimming Devices

BOSTON, MASS., Aug. 14—The regulation of motor headlights in Massachusetts will probably go into effect about Oct. 1, or shortly thereafter, according to the present plans of the Massachusetts Highway Commission. At the headlight test a few nights ago there were forty cars with devices put through a series of maneuvers over various roads. First the cars were started through one of the long avenues of the Country Club where there are no lights. Chairman Sohier and Commissioners Synan and Kemp of the Highway Commission stood in the road and halted the cars. The three men stood about 30 ft. in front of each machine when it stopped and then noted how far up on their bodies the lights threw their rays. Then they stood on the roadside and asked the drivers if they could see them with their lamps.

The cars were then sent around the avenue and out on the main street near the grounds. There the commissioners with their engineers and other officers of the department together with an advisory committee of motorists rode in every machine around several streets, some lighted and some dark. They made notes of how the lights work in picking out objects; how the dimmers responded to the control, etc. Some devices were operated by a pedal, others by hand, and others were merely the lens or globes in the headlights. There were men with devices from Detroit, Chicago and Los Angeles.

The advisory committee is to meet next week and draw up a report to submit to the highway commission, and the latter body will then formulate some regulation which will become law when the Governor and council approves of it after it is advertised throughout the State.

45,000 Cars for Detroit

DETROIT, MICH., Aug. 14—No separate record being kept for any city, the exact number of automobile licenses issued thus far this year to residents of Detroit could not be determined at the office of the Secretary of State, but the number is estimated by officials to be nearer 36,000 than 35,000. This means that thus far this year between 12,000 and 13,000 new cars have been registered by Detroiters. Officials estimate that by the end of 1916 Detroit will have from 45,000 to 50,000 automobiles.

Last year it was decided by the U. S.

Government to have a special census taken of the village. The returns showed that there are now 21,242 inhabitants, which has caused the village of Hamtramck to be raised from the status of a third or fourth class city to that of a first class city. It means, among many other things, that the people will get free delivery of mail and that the pay of the officials of the post-office is to be raised.

All this is due practically entirely to the fact that Dodge Bros. are now motor car manufacturers. They now employ over 9000 men in their plant.

Gaulois Tires Reduced Temporarily 25 Per Cent

NEW YORK CITY, Aug. 16—The Gaulois Tire Corp. has reduced its tire prices 25 per cent, effective only for this week. The following prices are given on a few of the popular-sized tires:

Size	32 x 3 1/2	34 x 4	36 x 5
Plain tread	\$15.11	\$20.29	\$28.65
Non-skid	18.19	24.34	34.27

Not more than two tires will be sold to any one purchaser and orders received after noon of Aug. 21, will not be executed except at full list price.

Crawford Now in Detroit

DETROIT, MICH., Aug. 14—Chief Engineer C. S. Crawford of the Cole Motor Car Co., Indianapolis, is now a Detroit. Owing to the fact that the largest part of the materials and parts used by the Cole company come from Detroit it has been found advisable and more satisfactory to have the chief engineer of the company in closer touch with these concerns from which parts and components are purchased. All designing work will also be done here in Detroit, which is another reason of the removal.

Security Prices Higher

Sturdy Demand in All Stocks —Willys-Overland Makes High Mark

NEW YORK CITY, Aug. 16—Substantial gains in the security markets occurred last week. The gains this week range from a half to thirty-eight points. The losses were light, ranging from one-quarter to three points. The highest gain was noted on Wednesday when Willys-Overland rose thirty-eight points. This rise was the feature of the market. The next highest gain was made by Studebaker, a rise of fifteen and a quarter points. General Motors was also a feature, with a fifteen-point gain. There were also noted many substantial gains in the tire markets, the highest of which was Kelly-Springfield second preferred, which rose twenty points. The rest of the rubber gains were heavy, ranging from one to fifteen points. The Detroit issues also showed very large gains, General Motors common being the feature of the market with a twenty-point rise. Reports of good earnings brought Studebaker common up fifteen and a quarter points. The inactive stocks remained quiet; the only gain that occurred was that of the Atlas Drop Forge Co., making a rise of two and a half points.

Air Spring Co. Formed in Bradford

BRADFORD, PA., Aug. 12—Articles of incorporation of the Bradford Air Spring Co. have been applied for. This

company has been building and testing on a small scale for the last three years, and now will start producing on a larger order. The directors of the company are J. A. Fraunheim, W. W. Hughes and F. M. Nash, the offices being located in the Schoenblom Building at Main and Kennedy Streets.

The company controls several patents on pneumatic springs for vehicles. The spring itself is automatic. The air is pumped into the cylinder by the motion of the car, and as each spring is individual, three of the wheels may ride on the road and only one be raised when the car comes in contact with an impediment. The individuality of each spring permits of uneven distribution of the load in a car without affecting the level position of the body.

In addition to the plant of the Bradford company, the shops of Bovaird & Co. will be utilized for the present.

Wayne Wheel & Bow Elects

WAYNE, MICH., Aug. 14—At a meeting of those interested in the recently organized Wayne Steering Wheel & Bow Co. the following officers were elected: William Wetherell, president; J. C. Coleman, vice-president; A. A. Snyder, treasurer; Miss E. John, secretary. The board of directors consists of the first three named officers and C. Papke, V. Vallance, E. Hoops and H. Ditmer.

Baughman Winton Sales Mgr.

NEW YORK CITY, Aug. 16—O. F. Baughman has been appointed sales manager of the Winton company, Cleveland, Ohio. Mr. Baughman has been connected with the sales department of that company since 1903.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914		1915		Wk's Ch'ge
	Bid	Asked	Bid	Asked	
Ajax-Grieb Rubber Co. com.	300	..	..	..	..
Ajax-Grieb Rubber Co. pfd.	101	110	..	..	..
Aluminum Castings pfd.	100	102	..	..	..
J. I. Case pfd.	70	79	..	..	..
Chalmers Motor Co. com.	87	90	..	..	..
Chalmers Motor Co. pfd.	94	97	..	..	..
Electric Storage Battery Co.	62 1/2	64	..	..	..
Firestone Tire & Rubber Co. com.	510	515	..	..	..
Firestone Tire & Rubber Co. pfd.	111	..	..	..	..
General Motors Co. com.	218	220	..	..	..
General Motors Co. pfd.	107	110	..	..	..
B. F. Goodrich Co. com.	58	59	..	..	..
B. F. Goodrich Co. pfd.	117 1/2	108	..	..	..
Goodyear Tire & Rubber Co. com.	268	270	..	..	..
Goodyear Tire & Rubber Co. pfd.	107	108 1/2	..	..	..
Gray & Davis, Inc., pfd.	..	..	..	..	..
International Motor Co. com.	25 1/2	26 1/4	..	..	..
International Motor Co. pfd.	48 1/2	49	..	..	..
Kelly-Springfield Tire Co. 1st pfd.	184	185	..	..	..
Kelly-Springfield Tire Co. 2d pfd.	86	88	..	..	..
Maxwell Motor Co. com.	180	183	..	..	..
Maxwell Motor Co. 1st pfd.	40	42	..	..	..
Maxwell Motor Co. 2d pfd.	86 1/2	87 1/2	..	..	..
Miller Rubber Co. com.	34 1/2	35 1/2	..	..	..
Miller Rubber Co. pfd.	195	..	..	..	..
New Departure Mfg. Co. com.	107	107 1/2	..	..	..
New Departure Mfg. Co. pfd.	..	..	..	..	..
Packard Motor Car Co. com.	..	120	..	..	..
Packard Motor Car Co. pfd.	97 1/2	100 1/2	..	..	..
Peerless Motor Car Co. com.	70	73	..	..	..
Peerless Motor Car Co. pfd.	81	83 1/2	..	..	..
Portage Rubber Co. com.	42	..	..	..	..
Portage Rubber Co. pfd.	92	94	..	..	..
*Reo Motor Truck Co. com.	17 1/2	18	..	..	..
*Reo Motor Car Co. com.	33	34	..	..	..
Splitdorf Electric Co. pfd.	..	..	..	..	..
Stewart-Warner Speed. Corp. com.	66	68	..	..	..
Stewart-Warner Speed. Corp. pfd.	105	107	..	..	..
Studebaker Corporation com.	99	100	..	..	..
Studebaker Corporation pfd.	104	105	..	..	..
Swinehart Tire & Rubber Co.	85	90	..	..	..
Texas Company	143	143 1/2	..	..	..
U. S. Rubber Co. com.	47 1/2	48	..	..	..
U. S. Rubber Co. pfd.	103	103 1/2	..	..	..
Vacuum Oil Co.	218	221	..	..	..
White Company pfd.	110	..	..	..	..
Willys-Overland Co. com.	184	186	..	..	..
Willys-Overland Co. pfd.	104	107	..	..	..
ACTIVE STOCKS					
Chalmers Motor Co. com.	99 1/2	87	..	..	..
Chalmers Motor Co. pfd.	..	96 1/4	97 1/4	..	..
Continental Motor Co. com.	155	180	..	300	..
Continental Motor Co. pfd.	..	75	83	86	..
General Motors Co. com.	66	70	216	220	..
General Motors Co. pfd.	80	86	108	110	..
Maxwell Motor Co. 1st pfd.	..	..	40	43 1/2	..
Maxwell Motor Co. 2d pfd.	..	..	86 1/2	88 1/2	..
Maxwell Motor Co. com.	..	..	35	37	..
Packard Motor Car Co. com.	..	114	..	..	..
Packard Motor Car Co. pfd.	..	97	99	..	..
*Reo Motor Car Co.	20	21	33	33 1/4	..
*Reo Motor Truck Co.	11 1/2	12	17 1/2	18	..
Studebaker Corporation com.	..	..	95	98	..
Studebaker Corporation pfd.	..	..	103 1/2	106	..
INACTIVE STOCKS					
*Atlas Drop Forge Co.	19	..	28	..	..
Ford Motor Co. of Canada, Ltd.	..	560	1475	..	..
Kelsey Wheel Co.	..	..	205	..	..
*W. K. Pruden Co.	..	20 1/2	20 1/4	..	..
Regal Motor Car Co. of Canada pfd.	23	..	..	21	..
BONDS					
General Motors, notes, 6s, 1915.	100	..	..	..	..
Packard Motor Car Co., 5s, 1916.	..	..	98 1/4	..	..

*Par value \$10; all others \$100 par value.

Twenty-Seven Entries for Elgin

Eleven Contestants for C. A. C. Cup Race and Sixteen for Elgin Trophy

CHICAGO, ILL., Aug. 17—Twenty-seven entries have been received for the fifth annual Elgin road races which will be run over the 8.36 mile Kane County course on Friday and Saturday of this week. The Chicago Automobile Club Cup event, which will be held Friday, and for which cars of a piston displacement of 300 cu. in. or less are eligible, has attracted eleven nominations while there will be sixteen contenders for the Elgin trophy in Saturday's event for which the maximum piston displacement is set at 450 cu. in.

Many Stars Entered

With the exception of Dario Resta and Bob Burman, the Elgin meet has attracted the majority of the stars of America's speed firmament and the two races, each of which will be 301 miles in length, promise to be bitterly contested and faster than those of last year when Ralph De Palma averaged a fraction better than 73 miles per hour in scoring a double victory with his Mercedes.

De Palma Defends Trophies

De Palma will be on the starting line to defend both of the trophies that he captured last August. He will have some stubborn opposition for among his challengers are Earl Cooper, winner of the 1913 American road-racing championship; Gil Anderson, the pioneer of the Stutz team who captured the Elgin trophy 2 years ago; Barney Oldfield, the master driver of the world in his Delage, and Eddie O'Donnell, the star of the Duesenberg forces.

Ten for Both Days

Ten of the drivers will appear on both days of the speed carnival, the entrants of the following cars believing that their mounts have sufficient stamina to withstand the high-speed test of 602 miles; De Palma's Mercedes, Bragg's Stutz, Cooper's Stutz, Anderson's Stutz, Henderson's Duesenberg, O'Donnell's Duesenberg, Brown's Du Chesneau, Patrick's Mercer, Alley's Ogren and Oldfield's Delage. In fact, the Cornelian, to be driven by Frank Justen, is the only car in the C. A. C. Cup race that has not been entered in the Elgin trophy contest.

Six for Elgin Cup Only

Six cars have been groomed solely for Saturday's speed battle as follows: A Duesenberg, which probably will be driven by Eddie Rickenbacher; Andy Burt's Stutz, Scott's Anderson special,

Otto Henning's Mercer, Fred Robillard's Lozier and George Buzane's De Dietrich.

Ralph Mulford, who captured the 300-mile race on the Des Moines speedway 10 days ago, originally was scheduled to drive the third Duesenberg Saturday, but yesterday wired the promoters that it would be impossible for him to compete because of a business engagement in New York. An effort is now being made to induce Eddie Rickenbacher to take the mount. The Elgin course is faster than ever before, according to the drivers, who predict that the winners will be forced to average better than 80 miles an hour in order to annex the major portion of the prize money. The roads have been widened, rolled and oiled and two of the four turns have been reconstructed since last year.

The prize money for this year's races is the same as last year, \$3,000 each day, but the Elgin promoters have introduced an innovation in that they will give \$100 to each driver completing 100 miles and \$200 to each driver finishing 200 miles, provided they do not run one, two, three and therefore are not eligible to participate in the division of the regular purse, which will be split \$1,800 for first, \$700 for second, and \$500 for third.

Practice Starts at Elgin

ELGIN, ILL., Aug. 14—Practice for the Elgin races Aug. 21 and 22 started on the 8-mile course lying in the outskirts of Elgin. The track is immeasurably superior to former years and an average speed of 80 m.p.h. may not be impossible if weather conditions are favorable. The course has been oiled for several weeks and times made over it in practice were well above those of last year. Speeds of over 100 m.p.h. are being maintained on the straightaways.

ENTRIES FOR ELGIN FIRST DAY

Car	Driver	Car	Driver
Mercedes	De Palma	Du Chesneau	Brown
Stutz	Bragg	Mercer	Patrick
Stutz	Cooper	Ogren	Alley
Stutz	Anderson	Cornelian	Justen
Duesenberg	Henderson	Delage	Oldfield
Duesenberg	O'Donnell		

SECOND DAY

Car	Driver	Car	Driver
Mercedes	De Palma	Anderson Special	Scott
Stutz	Bragg	Du Chesneau	Brown
Stutz	Cooper	Mercer	Henning
Stutz	Burt	Mercer	Patrick
Stutz	Anderson	Ogren	Alley
Duesenberg	Henderson	Lozier	Robillard
Duesenberg	O'Donnell	DeDietrich	Buzane
Duesenberg	Rickenbacher	Delage	Oldfield

20,814 Cars in Oregon

SALEM, ORE., Aug. 14—Figures compiled by the Secretary of State show that at the close of business July 15, 20,814 automobiles had been licensed since the first of the year. This figure is more than 4000 in excess of the entire registration for 1914.

\$250,000 Speedway for Louisville

2-Mile Oval Planned—300 Acres Bought—Ready for Race by Spring

LOUISVILLE, KY., Aug. 14—If the present plans of local capitalists and men from Cincinnati and Indianapolis are carried out, Louisville will have a \$250,000 motor speedway, with a 2-mile oval course. Property aggregating 300 acres has been purchased and leased immediately south of and adjoining the Douglas Park race track, and it is proposed to construct a track which will attract the leading stars in the automobile racing field.

Incorporation of the Louisville Automobile Speedway and organization of the controlling company will be completed within 30 days, it is announced, and work will be started on the course within the following 30 days. Although it is declared to be possible that the first meet will be held in October, if the course can be completed by that time, the promoters announce that the speedway will be in shape for a big meet by spring.

The plans of the company call for the erection of a grandstand having a seating capacity of 10,000 persons. This stand will be arranged so that others can be added if needed.

Big Men Behind It

George L. Martin, of the real estate firm of Mueller & Martin, is one of the principal promoters. He secured the ground for the speedway. Interested with Mueller and Martin in the speedway project are Carl G. Fisher, originator and president of the Indianapolis Motor Speedway; Louis Seelbach, president of the Seelbach Hotel Co.; Patrick J. Hanlon, former vice-president of the American Tobacco Co.; Frank Fehr, president of the Frank Fehr Brewing Co.; Basil Doerhoefer, a local capitalist, and J. H. McKee, a Cincinnati capitalist.

With the exception of a tract of 55 acres leased from the J. F. Callaway estate for a term of years, all of the property was bought. Stonestreet & Ford, engineers in the Louisville Trust Building, are working out plans for the course, which will be designed to overcome defects apparent in other speedways. Built of 2 x 4 timbers set on end, it will enable drivers to attain a speed of 90 to 95 miles an hour.

It is proposed to offer purses of similar proportions to those given in Indianapolis and Chicago, aggregating probably \$50,000, thus attracting all the speed kings whose performances have drawn great crowds to the Indianapolis and Chicago races. Accommodations will be

provided for out-of-town motorists. Meets will be held at least one each year.

The controlling company will be incorporated with a capital stock of \$250,000, this sum covering the amount paid for fourteen pieces of land included in the 300 acres and for the cost of construction.

Corona Race for November 20

CORONA, CAL., Aug. 12—Definite arrangements for the Corona race to be run in November will be made early this week, and it has been practically decided that Nov. 20 will be the date.

The first action to be taken will be the disincorporation of the Corona Auto Racing Assn., which conducted the two former races. Immediately after the old organization passes into history a new association will be incorporated.

New Orleans \$1,000,000 Speedway Co.

DOVER, DEL., Aug. 14—The New Orleans Motor Speedway Assn., to carry on automobile racing in New Orleans, has been incorporated with a capital stock of \$1,000,000. The incorporators are S. W. Lindsay and J. C. Williams of Chicago, Ill.

The company plans to construct a speedway to cost about \$500,000, which will be finished in time for a long-distance race in February, 1916, the Saturday before Mardi Gras. The Mardi Gras race will be made an annual event.

Sheepshead Tickets on Sale

NEW YORK CITY, Aug. 16—The Sheepshead Bay Speedway Corp. to-day started the sale of tickets at its ticket office, 1696 Broadway, this city. The prices for the opening meet on Oct. 2 are as follows: Grand stand, \$3; bleachers, \$1; automobile parking spaces within oval of track, \$25, \$15, \$10 and \$5; boxes, \$50 and up, general admission, \$2. Each box accommodates six persons. A diagram of the entire field, stands, and parking spaces, together with maps from this city to the track, will be mailed upon request to the management.

Aug. 20 Cadillac Day

SAN FRANCISCO, CAL., Aug. 12—The officials of the Panama Exposition have set aside Aug. 20 as Cadillac Day at the fair. This is the first time that such an honor has been conferred on a motor car, and in this connection a State-wide tour for Cadillac cars has been announced that will bring Cadillac owners from all sections of California.

Armored Automobile Force Planned

NEW YORK CITY, Aug. 13—Members of the Automobile Club of America have been discussing a plan to organize a detachment of armored automobiles.

Detroit to Have Show Building

Auditorium 165 by 330 Ft. To Be Built—Next Detroit Show May Be Held There

DETROIT, MICH., Aug. 16—At last Detroit is to have an exhibition building and to local automobile dealers, especially to C. C. Starkweather, formerly president of the Detroit Automobile Dealers' Assn. and who is manager of the local branch of the Buick Motor Co. most of the credit is due for the success in launching the organization.

Upon property facing 205 ft. on Woodward and Cass Avenues and 450 ft. on Antoinette Street, there will be erected an auditorium and convention hall 165 by 330 ft. The hall will have a seating capacity for at least 24,000 people and it is expected that the next Detroit automobile show will be held in it.

The organization is known under the name of Merchants' and Manufacturers' Auditorium and will be incorporated. C. C. Starkweather is president; Walter Wilmot, who has been in charge of the local automobile shows for many years, is vice-president and general manager; W. J. Gordon, president of the Gordon Auto Sales Co. is treasurer and H. C. Bulkley, of Campbell, Bulkley & Ledyard is secretary.

On the street frontages the building is to be two stories high, 60 ft. deep on Woodward and Cass Avenues and 40 ft. deep on Antoinette, this for the purpose of providing a number of stores or show rooms 20 ft. wide for automobile supply dealers and manufacturer's agents or automobile dealers.

The interior of the exhibition hall will have two mezzanine balconies which may be used at show time for parts and accessory exhibits and which ordinarily will provide space for manufacturers agents and others.

Work on the new building is to be started within 30 days and it is expected that it will be ready by Jan. 1.

Mulford Special Stars on Track

FLEMINGTON, N. J., Aug. 13—A Mulford Special, driven by Ira Vail of Brooklyn, starred in the four 5-mile events and a pursuit race held at the ½-mile track here to-day, by taking three firsts and two seconds. In the Australian pursuit race, Joseph Lambert's mechanic, Amos Miller, in a Stutz was seriously injured when their car crashed through the fence in the final lap. Vail won this race.

Vail took first in the special invitation race with Lambert second, the time being 6:18. The next 5-mile event was for cars under 30 cu. in. piston displacement,

which was won by Vail, in 6:39½. The fastest time of the day was made by Theobald in a Mercedes, who won the free-for-all in 6:15½. Lambert's Stutz won the 5-mile handicap in 6:19.

5-Day Business Tour To Replace Wisconsin Reliability Run

MILWAUKEE, WIS., Aug. 14—To take the place of the annual Wisconsin reliability tour, admittedly a stimulant for motor car sales in Wisconsin, and to advertise the fall motor show to be held Sept. 13 to 17 in connection with the Wisconsin State Fair here the Milwaukee Automobile Dealers, Inc., will conduct a 5-day tour covering approximately 1000 miles Aug. 23 to 28. The pathfinder, an Overland, returned Saturday, Aug. 14, and reports unprecedented interest in the run. The tour will be purely of a business and social nature, with no contest features, and at least seventy-five cars are expected to participate. The exact mileage of the route is 965, and embraces every city of consequence in southern, eastern, western and the central part of Wisconsin.

Trying Out New Denver Traffic Rules

DENVER, COL., Aug. 14—Three new traffic regulations are being tried out in Denver under ordinances just put into effect, following a recent avalanche of fatal and otherwise serious accidents involving motor cars, other vehicles, street cars and pedestrians.

One prohibits cars from parking on streets in the business section with either of the inside wheels farther than 2 ft. from the curb, or the front line of the car closer than 4 ft. to the rear line of the car next in front. This restriction applies especially to the business streets having street car lines, where crowded conditions have become a menace to all kinds of traffic.

Another requires headlights on all bicycles and motorcycles while in motion, and rear lights on all carriages and all other kinds of vehicles, whether moving or standing, with the exception of vehicles used for transporting oil or gasoline. These headlights must show a white light visible a distance of 50 ft. in the direction of travel, and the rear lights must show a red light visible 20 ft. to the rear. All vehicles loaded with materials projecting from the rear must carry the red signal light at the extreme rear point of such projecting materials.

The third establishes marked courses for pedestrians to cross the streets inside the curb line at street intersections, and prohibits crossing an intersection at an angle or crossing a street in the middle of a block. White lines in both directions form a square for vehicle traffic at all street intersections in the business district, and pedestrians are not allowed inside this square.

Predict Rise in Crude Oil Price

Scarcity Will Affect Gasoline Price, Say Texas Oil Men
—650,000 Bbl. Yearly

HOUSTON, TEX., Aug. 13—It is the expressed opinion of leading oil operators of Texas that there will be a big increase in the price of light crude oil, suitable for refining, during the next few months. In consequence of the growing scarcity of the product the prices of gasoline will naturally show a corresponding raise. W. H. Gray of Houston, who has made a study of the situation, said:

"The world is now using approximately 650,000 barrels of lubricating and light crude oils daily. If the present rate of increase of consumption of these oils continues for seven years there will be at that time a total of more than 1,000,000 barrels used daily. Of the present consumption Texas produces about 40,000 barrels daily and Oklahoma about 325,000 barrels daily. The balance of the daily production comes from the Eastern fields. Of course, new fields of light crude oil may be found that will make a change in the situation which the consumers and operators are now facing. Prospecting for such fields is going on in many parts of the world. Unless the production is materially increased prices will rise."

Dunkirk Leads Europe in American Cars and Trucks

DUNKIRK, FRANCE, July 24—American automobiles are to be found in this town in greater number and wider variety than in any other place on the Continent of Europe. This is due to the fact that while Dunkirk is a French town, it is also an important military center for both the Belgians and the British. The town is actually within sight of the Belgian frontier, and as there is now no big town in Belgium left to the Belgians, Dunkirk forms a most convenient refuge.

The British Army Service Corps is making a big use of Peerless trucks; the Canadians also have a number of Peerless. The French in this neighborhood are mostly supplied with trucks and cars from their own factories, although not far from here there are a number of 2-ton Whites used almost exclusively for carrying troops to and from the trenches. The Belgians have enough American automobiles to run a New York show: Fords, King, Overland, Krit, and other light rigs, used mostly for ambulance work; Pierces predominate in trucks, and Italy has supplied them with a number of Fiats and Diattos. These Italian cars are mostly touring car chassis. Since

Italy came into the war the Belgians have had much trouble in getting spare parts for their Italian cars.

The Pierce 2-ton trucks are looked upon as a luxury. All drivers I have been able to talk to are delighted with them—but are unanimous in kicking against the governors. As the officers insist on governors being fitted, and would not allow them to be taken off under any condition, the drivers' kicks are altogether ineffective. All the Belgian drivers are speed mad, and they dislike being held down to 20 kilometers an hour by a little governor which they cannot take off.

St. Louis Gasoline Cut Raises Crude Oil Price

ST. LOUIS, MO., Aug. 14—The alleged war of the Standard Oil Co. against independents in St. Louis will be called to the attention of the Independent Petroleum Marketers Assn. of the United States at its annual convention in Milwaukee, Wis., on Aug. 25 and a reciprocal slap at John D. Rockefeller's company will be demanded by the local dealers.

Announcement to this effect was made here to-day by F. C. Bretsnyder, president of the Bell Oil Co. and an officer in the national organization. The fight during the last eighteen months has brought the retail price of gasoline down from 17½ cents a gal. to 8.9 cents a gal., a cut of almost 50 per cent and has raised the price of crude oil 25 per cent, Mr. Bretsnyder said.

While the price of gasoline has been reduced in many eastern cities also, local dealers claim that nowhere has it been cut so frequently and deeply as in St. Louis. Almost invariably the cuts of 1 cent each were first announced here by the Standard Oil. The Pierce Oil Corp. soon followed and the smaller dealers fell into line.

N. Y. Safety First Society Recommends New Laws

NEW YORK CITY, Aug. 12—The Safety First Society of New York to-day concluded an investigation of street accidents during several months by recommending to the Board of Aldermen to pass ordinances on the following:

Providing for the elimination of dazzling head and side lights on automobiles.

Requiring parallel parking at the curb for all vehicles of the delivery type.

Requiring the use of mirrors on all motor vehicles in Greater New York.

Requiring owners of all motor vehicles with chain drive to inclose the chains with suitable guards.

Making it a misdemeanor for any person to "hitch on" or trespass upon a motor truck or horse-drawn vehicle, unless employed by the owner of such vehicle.

The society also favored provision in buildings for runways for loading and unloading vehicles so as to relieve street congestion.

135,000 Cars for Michigan

LANSING, MICH., Aug. 14—Officials of the Secretary of State's Department have been indulging in some figuring as to what the new Michigan automobile tax law will mean to the state in the way of revenue. Basing their estimates upon the issuance of 135,000 license numbers, and the average tax per car at \$12, the state would receive a minimum of \$1,620,000 from the owners or users of automobiles during the first year the new law is in force. This would be more than double the amount estimated when the law was discussed.

The Newell Smith automobile tax law which goes into effect Jan. 1 provides for a tax of 25 cents per horsepower plus 25 cents per each 100 lb. of weight. Up to the end of this week more than 102,000 tags have been issued for 1916 cars, and at the rate they are being applied for the officials believe that 135,000 cars will be licensed by the end of the year.

Gasoline Up 1 Cent in New York City

NEW YORK CITY, Aug. 17—Gasoline went up a cent to-day, from 13 to 14, delivered to the garageman. The Standard Oil Co. and the Texas Co. both raised. The last previous raises were: Standard, July 27, from 12 to 13; Texas, July 28, from 12 to 13.

Ohio's New Laws in Effect

COLUMBUS, OHIO, Aug. 13—The announcement is made by the Ohio Automobile Department that the new laws governing the operation of automobiles in the State, passed by the Ohio Legislature at the last session are now becoming effective.

The law making it a felony to change a manufacturer's serial number or to have a car with a changed number in his possession became effective July 29. The law permitting the transfer of number plates from one car to another by the same owner by the payment of a fee of \$1 became effective Aug. 1. The law reducing the fees for registering manufacturers and dealers from \$20 to \$10 became effective July 25.

Donaldson, Sr., Killed in Race

SPIRIT LAKE, IOWA, Aug. 13—R. E. Donaldson, owner of the Emden car, which finished in eleventh place in the Indianapolis 500-mile race, and father of H. G. and L. C. Donaldson, both of whom participated in the race as mechanics, was killed instantly in an automobile race here this afternoon. The sons won first and second places.

Factory Miscellany

Martin Body to Add—The Martin Metal Co., Wichita, Kan., builder of metal automobile bodies, is planning an addition to its plant.

Covert to Build—The Covert Motor Vehicle Co., Lockport, N. Y., has let a contract for a three-story and basement, 44 by 96-ft. factory building.

Hancock Co. Adds—The Hancock Mfg. Co., Charlotte, Mich., manufacturer of automobile sundries, is completing the erection of a brick and steel addition to its plant, 80 by 160 ft., doubling its capacity.

F. W. D. Extending—The Four Wheel Drive Co., Clintonville, Wis., is erecting a large addition to its present factory, to cover an area of 100 by 185 ft. New machinery and equipment will also be purchased.

To Make Bodies—The Nineveh Coach & Car Co., Nineveh, N. Y., has increased its capital stock and will erect additional buildings for the manufacture of automobile bodies. New equipment will also be installed.

Western Supply Enlarges—The Western Auto Supply Manufacturing Co., Bellingham, Wash., will construct a 50-ft. addition to its plant and install new machinery, including testing machine, generator, cylinder boring machine, etc.

Moreland Truck Doubles Capacity—The capacity of the Moreland motor truck factory is to be more than doubled. This will mean that more than 100 motor

trucks of this make are to be manufactured in Los Angeles every month. This company is also prepared to spend \$1,500,000 each year in bringing the Los Angeles plant up to its full capacity. Moreland distributing and service stations are to be established in all the important towns of southern California.

Chester Rubber Adds—The Chester Rubber Tire & Tube Co., Chester, W. Va., a subsidiary of the New York firm, is erecting extensive additions to its plant, which is expected to increase its capacity about eight times.

New Akron Tire Co.—A new tire-making plant will be established in Akron, Ohio, by the Western Tire & Rubber Co. A three-story building, 60 by 150 ft., will be erected and a power plant will be installed.

Overland Warehouse Started—Construction of the Willys-Overland \$250,000 warehouse plant in the Midway, St. Paul, has been begun. Excavation is being done with an immense crew of men, steam shovels and dinky trains.

Simple Engine Co. Moves—The Simple Gas Engine Co., Brainerd, Minn., has moved its offices and works to Ashland, Wis., and is now producing a line of internal combustion engines. The company occupies the former plant of the Ski Mfg. Co., and its foundry work is done under direct supervision at the Nelson Roen Foundry Co. C. A. Anderson is general manager and chief engineer.

To Make Carbureters, etc.—Thomas

Spence, president, and W. G. Spence, vice-president of the Rundle-Spence Mfg. Co., 100 Second Street, Milwaukee, manufacturing plumbers' and steamfitters' supplies, are the moving spirits in the organization of the Turbo Motor Devices Co., capital stock \$30,000, which intends to manufacture and market a number of appliances for internal combustion engines, including a carbureter. Associated with the Spence interest in the new concern are M. L. Fykse and L. M. Smith.

Linde Air Products' Milwaukee Plant—The Linde Air Products Co. of New York has purchased a large factory site at Thirty-eighth and National Avenues, Milwaukee, and will at once establish a branch plant to serve Milwaukee and Wisconsin users of welding and cutting apparatus. The site is 150 by 700 ft. and is located on the joint belt line railroad. The building will be of concrete and brick, one-story, 150 by 250 ft. in size and cost about \$50,000. Until now the Chicago branch has been supplying this territory, but the growth of the use of the oxygen welding and cutting process, together with the use of the equipment for cleaning gas engines, necessitated the establishment of a direct branch in the heart of the Milwaukee manufacturing district. The new shop will be ready by May 1 and there will be 100 operatives engaged for its operation. The Linde company, an \$18,000,000 corporation, recently was licensed to do business in Wisconsin.

The Automobile Calendar

Aug. 20-21.....Elgin, Ill., Road Races.
Aug. 23-28.....Milwaukee, Wis., Wisconsin Reliability Tour.
Aug. 26.....Ventura, Cal., Show.
Aug. 30.....Columbus, O., Show, Ohio State Fair, Columbus Auto. Show Co.
Sept.....Peoria, Ill., Second Northwestern Road Congress.
Sept. 4.....Twin City, Minn., 500-Mile Race; Twin City Motor Speedway Co.
Sept. 6-9.....Worcester, Mass., Show, Dealers' Assn.
Sept. 6-10.....Indianapolis, Ind., Show, Indiana State Fair.
Sept. 6-15.....Detroit, Mich., Show, Michigan State Fair.
Sept. 8-11.....Hamline, Minn., 2-Day Meet at State Fair Grounds between Minneapolis and St. Paul, State Fair.
Sept. 13-17.....Milwaukee, Wis., Show, Automobile Dealers' Assn.
Sept. 13-17.....Oakland, Cal., Pan-American Road Congress.
Sept. 17-18.....Peoria, Ill., Illinois Garage Owners' Assn. Convention.
Sept. 18.....Providence, R. I., 100-Mile Race, Narragansett Park Speedway, Inc.
Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.

Sept. 20-25.....San Francisco, Cal., International Engineering Congress.
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.
Sept. 27-Oct. 10.....Denver, Col., Show, International Soil Products Exposition, Automobile Trades Assn. of Colorado.
Oct.....Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2.....Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2.....New York City, Sheepshead Bay Motor Speedway Track Meet.
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 3-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.

Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9.....Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 18.....Arizona 150-mile Grand Prix.
Nov. 20.....Corona, Cal., Road Race.
Nov. 29-Dec. 4.....Electric Prosperity Week.
Dec. 31.....New York City, Show; Grand Central Palace.
Jan. 22, 1916.....Chicago, Ill., Show; Coliseum.
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry



Smith Sales Mgr.—A. J. Smith has returned to automobile circles in San Francisco, and has taken the position of sales manager with the Reliance Automobile Co., northern California distributors of the King car.

Schramm Resigns from Packard—R. I. Schramm, until recently assistant advertising manager of the Packard Motor Car Co., Detroit, Mich., recently resigned to become distributor in Ottawa, Canada, for the Ford Motor Co. of Canada, Ltd.

McKenzie Goes to Portland—L. E. McKenzie, formerly in charge of the Studebaker interests in Pittsburgh, has been appointed assistant manager of the Portland branch, succeeding Clete Mulick, who has been transferred to the San Francisco Studebaker branch.

Knoble Hyatt Assistant Advertising Mgr.—Cliff Knoble, formerly with the National Cash Register Co., Dayton, Ohio, where he was connected with the advertising department, has been appointed assistant advertising manager of the Hyatt Roller Bearing Co., Detroit, Mich., and will assist Advertising Manager W. E. Biggers at the Detroit headquarters.

Bunnell Heads Portland Chalmers—Portland, Ore., has been chosen as the executive headquarters for the Chalmers Motor Co., with Marc Bunnell as district manager. The territory will consist of the field north of California and west of the Dakotas. In the immediate future Mr. Bunnell will open up factory offices in Portland. The Chalmers agency for Oregon and Washington will be retained by the veteran dealer, H. L. Keats.

Garage

Regal to Move—The Regal Motor Co. of Boston, Mass., has signed a lease to occupy part of the new building just erected on Commonwealth Avenue and Beacon Street, Boston, Mass., the other sections of which will be used by the Reo and Hupmobile agencies.

Willard Branch in Cleveland—A new branch of the Willard Storage Battery Co. has been opened by the company in its home city of Cleveland. The location selected for this branch is 2027 Euclid Avenue. Full equipment for recharging, repairing and renewing has been installed, and a complete stock of batteries is carried. Thus the new station will be a great convenience, not alone for car owners, but for dealers.

Motor Men in New Roles

Conrad Resigns from Pullman—H. W. Conrad has resigned as sales manager of the Pullman Motor Car Co., York Pa., taking effect July 31.

Brodhead Joins N. Y. Marmon—Walter Brodhead has been made manager of the Marmon used car department in New York City.

Willemin Makes Hupp Change—A. B. Willemin, who has been with the Hupp Motor Car Co., Detroit, Mich., for the past 3 years, and who was director of purchases, has been appointed assistant general manager.

Remsen Gets Studebaker Promotion—A. H. Remsen has been appointed assistant office manager of the Studebaker Corp., Detroit, Mich. He was previously connected with the parts order department.

Baeder Stewart - Warner Rep.—J. J. Baeder has been appointed traveling representative for the State of Michigan by the Stewart-Warner Speedometer Corp., Detroit, Mich. He was heretofore with the Cleveland headquarters of the concern.

Merrill Winton Sales Mgr.—A. J. Merrill, who has been connected with the Los Angeles branch of the Winton Motor Car Co., has been elevated to the position of sales manager. Mr. Merrill fills the vacancy caused by the resignation of J. S. Wiese.

Sherbondy Resigns—F. P. Sherbondy, chief electrician for S. F. Bowser & Co., Fort Wayne, Ind., for the past 5 years, has resigned and has assumed the management of the Exide storage battery and service station, South Bend, Ind., now being established.

White Detroit Eastern Rep.—The Detroit Motor Car Co., Detroit, Mich., has appointed A. F. White its Eastern representative. His territory will include China, Japan, the Philippine Islands, India, the Federated Malay States, Burma, Ceylon.

Arner Heads Columbus Tire Co.—George A. Hasson & Co. is the name of a new tire concern located at 75 North Fourth Street, Columbus, Ohio, with G. A. Arner as manager and G. H. Fisher district sales manager. The company is agent for the Chester and Traveler lines of tires and tubes.

Sells Joins Chandler Agency—The Chandler Motor Car Co. of Los Angeles, Cal., has acquired the services of E. N. Sells. Mr. Sells has been placed in

charge of the Chandler interests in Santa Barbara, Kern, San Luis Obispo, Ventura and Inyo Counties. Sells was formerly with the Earle C. Anthony forces and for the past 2 years was in charge of the San Francisco branch of the company.

Barnwell Waverley Mgr.—S. E. Barnwell, formerly sales manager of the truck department of the Kentucky Wagon Manufacturing Co., has been appointed manager of the Louisville office of The Waverley Co., 206 East Broadway. He succeeds K. A. Ridenor, who resigned several weeks ago to become assistant to Roy Potts, vice-president of the Madison Motor Co., Anderson, Ind.

Jenkins Master Carburetor Rep.—W. M. Jenkins, who left Los Angeles last summer to take up active work in the East when the Master Carburetor Co. opened the Detroit factory, has returned to Los Angeles as Pacific Coast representative of the Master interests with headquarters there. F. A. Hartwell, formerly with the Southwestern Carburetor Co. at Phoenix, Ariz., distributors for Master carburetors in Arizona, New Mexico and Texas, is now in charge of the new Master salesroom in Los Angeles, having been appointed city sales manager for the local branch of the Detroit factory, which supplies the Pacific Coast.

Dealer

More Room Needed—Mitchell & Smith, one of the big accessory companies of Boston, Mass., has been obliged to enlarge its quarters and has secured more space in the building 1090 and 1092 Commonwealth Avenue.

Stutz Moves Again—The Becker-Stutz Automobile Co., which took over the Stutz in Boston, Mass., last week and moved to 911 Boylston Street, has again moved, this time to 793 Boylston Street, where it has the entire building.

Oldsmobile Service Station—The Oldsmobile Motor Co., Boston, Mass., has just leased the building on Landsdowne Street, Cambridge, formerly used by the Buick Co. as a service station, and it will maintain a repair department there.

Lee Takes On G. M. C. Truck—Don Lee, Los Angeles, Cal., will handle the General Motors Co. truck line in California in the future. Lee now represents the largest and most complete line of any California dealer. He has the Cadillac for the entire State and the Oakland for northern California.